LEVEL II

(12)

WARNING SYSTEM RE-EVALUATION AND LOCAL GOVERNMENT GUIDANCE UPDATE

FINAL REPORT

AUGUST 1979

DCPA 01-78-C-0229
DCPA WORK UNIT 2234D
CSC-4527-1

DISTRIBUTION: APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

COMPUTER SCIENCES CORPORATION

6565 Arlington Boulevard

Falls Church, Virginia 22046

Major Offices and Facilities Throughout the World

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: CSC-4527-1 (14)	2. GOVT ACCESSION NO.: -----
	3. RECIPIENT'S CATALOG NUMBER: -----
4. TITLE (and Subtitle): (6) WARNING SYSTEM RE-EVALUATION AND LOCAL GOVERNMENT GUIDANCE UPDATE.	5. TYPE OF REPORT & PERIOD COVERED: (9) FINAL REPORT.
	6. PERFORMING ORG. REPORT NUMBER: -----
7. AUTHOR(s): (10) C. R. Driscoll, C. D. Bethel, Jr., C. J. Bertsch	8. CONTRACT OR GRANT NUMBER(s): (15) DCPA01-78-C-0229 new
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Computer Sciences Corporation, 6565 Arlington Boulevard, Falls Church, Virginia 22046	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: WORK ~~UNIT~~ 2234D
11. CONTROLLING OFFICE NAME AND ADDRESS: Federal Emergency Management Agency, Washington, D.C. 20472 (11)	12. REPORT DATE: 7 August 1979
	13. NUMBER OF PAGES: 196
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): ----- (12) 206 p.	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE: ----

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

-----

18. SUPPLEMENTARY NOTES

-----

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Alert
Civil Preparedness
Communications
Crisis Relocation Planning (CRP)
Decision Information Distribution System (DIDS)
Emergency Broadcast System (EBS)
Emergency Communications (cont'd)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This (9) final report presents the results of an evaluation of the capability of the current national warning system to alert and warn Federal, state, and local officials and also the general public in the event of an impending or actual attack on the nation. The study also considered warnings required due to natural disasters or man caused events.

Alternative alerting and warning systems, old and new, were → (cont'd)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

405 717

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

19. KEY WORDS (cont'd)

National Warning System (NAWAS)

20. ABSTRACT (cont'd)

evaluated. A detailed report on facilities supporting the State of Colorado, the Colorado Springs (Risk Area) and the Fremont County (Host Area) are included.

The report provides conclusions on system weaknesses and recommended actions for developing an improved system.

Also included as appendices are State and local warning plans and a warning plan guide addressing crisis relocation planning.

WARNING SYSTEM RE-EVALUATION
AND
LOCAL GOVERNMENT GUIDANCE UPDATE

FINAL REPORT

AUGUST 1979

Prepared for

FEDERAL EMERGENCY MANAGEMENT AGENCY

Washington, D.C. 20472

CONTRACT DCPA 01-78-C-0229

DCPA WORK UNIT 2234D

BY: C. D. BETHEL, JR.

C.J. BERTSCH

C.R. DRISCOLL

COMPUTER SCIENCES CORPORATION

6565 Arlington Boulevard

Falls Church, Virginia 22046

Major Offices and Facilities Throughout the World

WARNING SYSTEM RE-EVALUATION
AND
LOCAL GOVERNMENT GUIDANCE UPDATE

(DETACHABLE SUMMARY)
FINAL REPORT

AUGUST 1979

Prepared for

FEDERAL EMERGENCY MANAGEMENT AGENCY

Washington, D.C. 20472

CONTRACT DCPA 01-78-C-0229

DCPA WORK UNIT 2234D

BY: C. D. BETHEL, JR.
C.J. BERTSCH
C.R. DRISCOLL

DISTRIBUTION

Approved for Public Release
Distribution Unlimited

FEMA NOTICE: "This report has been reviewed in the Federal Emergency Management Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Federal Emergency Management Agency."

COMPUTER SCIENCES CORPORATION

6565 Arlington Boulevard

Falls Church, Virginia 22046

EXECUTIVE SUMMARY - NATIONAL WARNING SYSTEM EVALUATION

BACKGROUND

The Defense Civil Preparedness Agency (DCPA) has among its missions that of providing warning of an impending or actual attack on the Nation to Federal, state, and local officials and the general public. In May 1978, DCPA awarded Contract DCPA-01-78-C-0229 to Computer Sciences Corporation (CSC) for the purpose of obtaining an overall assessment of the Nation's alert and warning system. The four major tasks required by the study are:

- Perform an assessment of the state and local warning system
- Perform an assessment of the backbone warning system
- Review and update the warning system operational requirements
- Recommend changes in the warning policy.

This report covers these tasks. A Crisis Relocation Plan (CRP) warning plan guide is provided which defines the methodology by which appropriate recommendations of the report can be applied to state and local areas. Also, warning appendices for the CRP plans of the State of Colorado, Colorado Springs risk area, and Fremont County host area are provided.

METHODOLOGY

Data for the study was obtained by review of applicable mission and policy statements, directives, plans, and reports. In addition, a series of visits were made to regional, state, and local civil defense facilities and organizations. These included a survey trip to Colorado, where visits were made to Region 6 in Denver, the Colorado state Civil Defense facilities, the National Warning Center in Cheyenne Mountain, the Colorado Springs risk area, and the Fremont County host area. Much valuable information was obtained by on-site review of their plans and other documents and by interviews with operational and planning personnel at all levels.

Additional important data was obtained by interviews and contact with related organizations including the Associated Press (AP), the United Press International (UPI), the National Law Enforcement Telecommunications Systems, Inc. (NLETS), the National Weather Service (NWS), the Department of Commerce, and the American Telephone and Telegraph Company (AT&T), among others.

The backbone and the state and local systems were analyzed and assessed, based on DCPA's mission, policy, and requirements guidance. Alternative systems and techniques were considered for upgrading the warning system. Conclusions and recommendations were made regarding policy, requirements, and the overall system. The required methodology guide and warning appendices were prepared and are included with this report.

STUDY FINDINGS

The National Warning System (NAWAS) is a system that is made up of a combination of 63 state warning circuits, plus 8 regional circuits and control circuits. It is leased from the Bell System and is a Selective Signaling System (SS-1) private line arrangement that provides for two-digit dialing to configure the network. The National Warning Center (NWC) or Alternate National Warning Center (ANWC), Olney, Maryland, can alert the network and send a verbal warning message to over 2300 Federal, state, or local stations on the network, simultaneously. The warning is disseminated to additional activities by fan out actions of those personnel receiving the NAWAS warning. Dissemination is accomplished by various means including radio or telephone calls to other counties or agencies, and to the general public by activating outdoor sirens, light and bell systems, and by having radio or TV stations broadcast the warning.

Backbone System

Over the past years the NAWAS system has provided an excellent warning capability for key Federal, state, and local officials. It is a well-established network

that has proven procedures and well-trained, highly motivated personnel. It is tested daily and performs with excellent results in meeting its backbone requirement. The Bell System provides excellent support and has fine alternate routing capability between major geographical locations. The system makes good use of hardened facilities and cable routes in many locations and also has electromagnetic pulse (EMP) protection features at major switching centers.

Despite these important favorable characteristics, the backbone system has significant weaknesses. These are:

1. The system is a 25-year old network that has grown from a few hundred drops to over 2300. This, as AT&T has stated, is near the upper limit for a practical multipoint circuit. There are many counties and communities as well as Federal, state, and local offices that it would be desirable to have on the warning circuit that are not on it. Instead, these localities and offices must get the warning through one or more levels of fan out calls.

2. While the system is very reliable from a peacetime viewpoint, it is highly vulnerable from a nuclear attack viewpoint. There are no stated requirements for alternate routing nor for high risk area avoidance. The loss of a few key nodes or circuits would greatly degrade the Nation's warning capability.

3. The backbone system is not currently designed to accommodate crisis relocation sites.

State and Local System

Many state and local activities receive the warning by having a NAWAS drop, and they are essentially the same as an integral part of the backbone system. It is the dissemination of the warning beyond the NAWAS drop level that constitutes the weakest part of the national warning system. The dissemination capability (fan out) varies from good to nonexistent. The most significant weakness is the lack of a positive means of alerting the general public on a 24-hour day basis. Good and bad aspects of the state and local system are discussed below.

Warning Points

Many states, counties, and local jurisdictions have, or are developing, excellent Emergency Operations Centers (EOCs) for the control and dispatch of emergency teams such as fire, police, ambulance, and all other types of rescue service. These EOCs are frequently underground protected shelters with excellent communications facilities and they are staffed 24 hours a day with professionals, trained to deal with emergency situations. They make excellent warning points.

Two problems that downgrade the utilization of these facilities as attack warning points are:

1. The personnel are routinely busy with actual current emergency situations and their attention or interest is small in the testing of a system for use in the unlikely event of a nuclear attack. Thus, they tend not to be concerned with actions they should take in event of a nuclear attack. This has been evidenced by their occasional slowness in responding to daily NAWAS tests due to being fully occupied dispatching emergency vehicles.

2. In many cases, EOC personnel do not directly activate the warning devices but must request personnel at another location to do so.

3. Frequently, they do not have adequate means of directly alerting the general public. An example is Adams County, Colorado, which has an excellent EOC but only two sirens to alert the county population of approximately 60,000 people.

Additionally, many counties and most state and local agencies as well as public and private institutions are not in NAWAS and are dependent upon some local fan out procedure to get the warning.

Fan Out Techniques

The NAWAS drop warning points use various techniques for disseminating the warning message. Among the better techniques are all-point broadcasts to other stations in the network. This gets the warning to all stations simultaneously. Similarly, warnings can be relayed simultaneously by dedicated telephone conference

networks. Many warning points make good use of these methods. However, other procedures simply call for dialing one point at a time. This is not too time-consuming if only one or two locations must be contacted, but in many cases the number of calls to be made exceeds 10 and has, in one case, exceeded 70.

Outdoor Warning Systems

The primary means of warning the general public is by activating outdoor warning systems. This study has used data based on siren coverage areas to develop population coverage estimates. However, estimates based on such coverage figures are high since most people in the coverage area are normally not outside to hear the siren. Instead they may be in their insulated homes or offices with double or storm windows and in a high noise environment with operating air conditioners. People outside may be in cars with the windows closed and a tape deck playing and may not be able to hear the siren. This is not to say that sirens should not be part of a warning system but rather it points out their major limitations and warns of the fallacy of assuming that all personnel within the theoretical outdoor warning coverage area actually would be warned by sounding of a siren.

Warning Dissemination Authority

Certain local warning plans require the agent on duty to get authority from a specific official such as the Civil Defense Director, or the Mayor, prior to initiating the warning procedures and sounding alarms. This additional delay is obviously unsatisfactory in an already time-limited situation.

REQUIREMENTS

The most significant factor in the requirements area is that there are no definitive operational or performance requirements describing what is required of the Nations's warning system. Congress and the Executive Branch have recognized the need for an integrated national warning system. In December 1970 the Office of Telecommunications Policy (OTP) established an Interagency Warning Steering Group that addressed certain problems relative to home warning systems. In 1976

a GAO report, "Need to Control Federal Warning System Proliferation" recommended in part that:

1. All Federal requirements for natural disaster and attack warning be defined and consolidated

2. An integrated national program to meet those requirements in the most operational and cost-effective manner be developed.

In February 1978, DCPA prepared a definitive listing of operational and performance requirements for such an integrated warning system. However, OTP no longer exists and at present neither the Department of Commerce, which assumed OTP's responsibility, nor any other agency is taking a lead role in getting such an integrated system defined and developed.

POLICY

The major policy statement impacting the national warning system program is the national policy issued by OTP in January 1975 which states that there would be a single government operated system for warning citizens in their homes of an enemy attack or a natural disaster and that system would be the NWS Radio System. Unless this policy were changed, such an attack warning system as the DCPA developed and successfully-tested Decision Information Distribution System (DIDS), could not be implemented. DIDS, a low frequency alerting and warning system, can work with demutable receivers just as the VHF NWS Radio System can. However, it has greater area coverage, requiring only 10 large transmitters to cover CONUS.

A second policy/requirements problem area is related and that is the question of who will notify the public, the local activity, or the Federal government. The Federal government theoretically can meet its requirement to warn the public by warning the state and local authorities who then can warn the public. However, some state and local authorities have expressed the feeling that the Federal government is not meeting its responsibility if it does not at least fund the system for warning the public.

An additional policy/requirement question that also causes confusion at the Federal, state and local level, is the question of whether the warning system is to warn of the initial attack only or if it must be survivable for use during and after the initial attack. Personnel encountered at all levels had different understandings of what the DCPA policy actually is.

RECOMMENDATIONS

The Nation does not currently have an adequate warning system. The existing system can provide rapid warning to the many key locations on NAWAS under peacetime conditions. However, many major segments of the population cannot be alerted in a timely manner on a 24-hour day basis.

The major weaknesses of the present system are:

1. Lack of adequate capability to clearly alert and warn the general public
2. System vulnerability.

The need exists to develop a complete modern warning system meeting operational and performance requirements similar to those proposed in Paragraph 6.3.2. Such a system should be Federally funded and controlled with the system providing warning directly to all appropriate Federal, state, and local agencies and to the general public.

In this regard, the Federal Emergency Management Agency (FEMA) should fund to take the leadership in developing the requirements for, and designing such a modern integrated system. Among key actions recommended are the following:

1. Develop and obtain general approval for definitive operational and performance requirements for an integrated national warning system
2. Clarify the responsibility for warning the general public by requirement and policy statements that clearly indicate the Federal government will develop and support a system that will provide warning directly to citizens' homes as well as to Federal, state, and local offices and to public and private institutions

3. Clarify by requirement and policy statements the need for the warning system to continue to operate in the trans- and post-attack phases as well as in pre-attack

4. In the development of the new warning system give consideration to the following:

   a. Use of satellite communications

   b. Use of mobile low frequency network

   c. Use of meteor burst communications for LF network control

   d. Utilization of the automated switching capability of AUTOVON for key terrestrial circuits

   e. Real time monitoring and display of status of key warning centers

   f. Automatic circuit/system trouble detection and reroute/restoral

   g. Automated activation of NWS Radio System for rebroadcast of warning message

   h. Adequate system security to prevent spoofing or accidental system activation

   i. Addition of an automated data network to provide hard copy for key warning centers. NLETS, AUTODIN, or similar networks should be evaluated as possible shared systems.

5. Upgrade the existing system to serve as an interim system. Actions that should be considered are:

   a. Each of the two NWCs should have positive and automatic control over each regional center

   b. Alternate routing of the control and regional warning circuits should be established, with the cooperation of AT&T, so that dual and widely

dispersed routes are available to link the NWCS with each other and to link the ANWC with the Northern Air Defense Command (NORAD) and the Alternate Command Post (ALCOP) sites that provide DCPA with the warning decision announcement

c. Investigate the utilization of AUTOVON trunking to provide the survivable links between the key NAWAS centers

d. Evaluate each state network from a technical and economic viewpoint to improve survivability and perhaps reduce costs. A closed loop configuration with more than one state entry point, separated from the primary entry point by at least 50 miles, would increase survivability. At least one entry point should not be in a high risk target area. This evaluation will require getting detailed routing information from AT&T. The costing can be particularly important as the current TELPAK low-cost tariffs are scheduled to be discontinued. If this occurs, major circuit redesign may be appropriate from a cost viewpoint as the current pricing configuration is designed to take advantage of available TELPAK (bulk rate) channels

e. Coordinate with NLETS to have the national warning released by the NWC to the NLETS computer for automated dissemination over all state networks tied in to NLETS. Additional CD drops could be added to state networks as required

f. Establish a program to support state and local officials in the completing/updating of state and local warning plans. Topics to be addressed in these plans include the following:

   (1) Impact of crisis relocation planning

   (2) Finalizing written operational agreements with area radio and TV station management

   (3) The use of NOAA Weather Radio in warning dissemination

(4) Provision for maximum use of available state and local networks as a primary or back-up warning dissemination capability

(5) Appropriate use of educated and conference circuits for support of fan out procedures

(6) Coordination of prearranged design and implementation plans for telephone or other communications services that may be required upon short notice in support of crisis relocation plans or other emergency situations.

ABSTRACT

This report presents the results of a study to assess the capabilities of present and potential backbone warning systems and also state and local warning systems. The objective is to evaluate the capabilities of the warning system to disseminate a warning from the National or Alternate National Warning Center to Federal, state and local officials, and to the general public. The evaluation gave particular emphasis on the impact of Crisis Relocation Plans (CRP) on the warning systems capabilities. Warning requirements and policy were also reviewed and changes recommended, as required. This report contains evaluation of backbone systems including the National Warning System (NAWAS), Associated Press (AP) and United Press International (UPI) news wires, National Law Enforcements Telecommunications System (NLETS), Decision Information Distribution System (DIDS) and others. Detailed analysis was made of Colorado state and local warning systems, addressing the Colorado Springs risk area and Fremont County host area. This report includes warning appendices for crisis relocation plans for the State of Colorado, Colorado Springs risk area, and Fremont County host area, as well as a methodology guide for implementing report recommendations in the state and local areas.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

LIST OF ILLUSTRATIONS

Figure

LIST OF TABLES

SECTION 1 - INTRODUCTION

1.1 BACKGROUND

The Defense Civilian Preparedness Agency (DCPA) has the mission of alerting and warning Federal, state, and local government agencies and the general public of the danger of an impending or on-going attack on the Nation. An additional mission is to provide warning of impending or actual natural or manmade disasters such as floods, major fires, accidental nuclear incidents, or other similar major disasters.

To rapidly disseminate the warning message the DCPA presently has a large, multipoint terrestrial voice network leased from American Telephone and Telegraph Company (AT&T). This network has over 2,000 stations on it. From many of these stations the warning is passed on by telephone fan out, sounding of sirens, radio and TV announcements, lights and bells, and in other manners to governmental activities and to the general public.

1.2 OBJECTIVES

The DCPA award to Computer Sciences Corporation (CSC) under Contract DCPA01-78-C-0229 provides for an assessment of the warning system. Specifically, the contract has four major objectives. These are:

1. Perform an assessment of state and local warning systems
2. Perform an assessment of backbone warning systems
3. Review and update the warning system operational requirements
4. Recommend changes in the warning policy.

This report covers work performed in accomplishing these objectives. Additionally, a Crisis Relocation Plan (CRP) warning plan guide is provided defining the methodology by which appropriate recommendations of the report can be applied to state and local areas. Also, warning appendices are provided for the CRP plans of the State of Colorado, Colorado Springs risk area, and Fremont host area.

1.3 PENDING REORGANIZATIONAL CHANGE

During the period of this study, major reorganizational changes were proposed and implemented in the Nation's emergency management area. President Carter approved Reorganization Plan No. 3 which provides for the establishment of a new independent agency, the Federal Emergency Management Agency (FEMA). This plan was designed to make a single agency accountable to the President, Congress, and the public for all Federal emergency preparedness, mitigation, and response activities.

The following agencies are consolidated into FEMA:

1. The Defense Civil Preparedness Agency
2. The Federal Disaster Assistance Administration (Part of Housing and Urban Development)
3. The Federal Preparedness Agency (Part of the General Services Administration)
4. The Federal Insurance Administration (Part of Housing and Urban Development)
5. The National Fire Prevention and Control Administration (Department of Commerce).

Other closely allied functions are also transferred to FEMA. These include:

1. The community preparedness program for weather disasters - under the National Weather Service (Department of Commerce)
2. The Earthquake Hazard Reduction Program - under the Office of Science and Technology (Executive Office of the President)
3. The Dam Safety Coordination Program - Office of Science and Technology (Executive Office of the President)
4. The Emergency Broadcast System - oversight responsibility (Executive Office of the President).

Additionally, the plan assigns to FEMA two emergency functions not assigned to any specific Federal agency:

1. Coordination of the emergency warning system
2. Federal response to consequences of terrorist incidents.

The functions of DCPA, which will be transferred to FEMA, include those related to the warning system. Hence, the observations, findings, conclusions, and recommendations contained herein are valid for either DCPA or FEMA.

1.4 STUDY METHODOLOGY

In addition to the review of the available documentation and plans, an integral part of the study was a series of visits to selected national, regional, state, and local civil defense facilities and organization. Valuable information was obtained by on-site review of their documents and interviews with operational and planning personnel. Contact was made with and important data obtained from many related organizations including AP, UPI, NLETS, the National Weather Service, and the Department of Commerce.

1.5 ORGANIZATION OF THE REPORT

The organization of the report is based on the tasking structure. Section 2 provides general background and a discussion of warning requirements. Section 3 provides discussion of current warning policy.

The assessment of the backbone warning system is addressed in detail in Section 4. The assessment of the capability to get the warning disseminated at the state and local level is addressed in Section 5. The impact of CRP is given particular attention. The final section, Section 6, presents the conclusions and recommendations developed during the analysis. The required Crisis Relocation Warning Plan Guide is provided in Appendix A and the three CRP warning plan appendices for the State of Colorado, the Colorado Springs risk area, and the Fremont County host area are included in Appendices B, C, and D, respectively.

SECTION 2 - WARNING REQUIREMENTS

2.1 PURPOSE

This section reviews the warning system qualitative and quantitative operational requirements in context with changes which have occurred over the past 5 years. These requirements will provide a basis for assessment of the backbone and state and local warning systems presented later. Conclusions and recommended changes of the requirements based on the warning system assessment are provided in Section 6.

2.2 MISSION

The assigned mission of the DCPA is to provide an effective and viable national civil defense program as expressed in the following documents:

Federal Civil Defense Act of 1950, as amended (50 U.S.C. App 2251 et sig)

Executive Order 10952 of July 20, 1961

Executive Order 11795 of July 11, 1974.

2.3 FUNCTIONS

The functional responsibilities derived from the legislative and executive orders are set forth in DoD Directive 5105.43 dated 14 July 1972. Among these responsibilities are a number of communications-related warning, reporting, and control functions. These include coordinating and providing direction to Federal, state, and local government agencies in the development and execution of the following:

1. Steps to alert the population of impending enemy attack upon the United States
2. All functions pertaining to civil defense communications including an appropriate warning network
3. A radiological reporting capability
4. Use of a civil defense communication system for warning the affected population of impending natural disasters.

Executive Order 10952 of July 20, 1961, cited the communication functions in terms of developing and executing all steps necessary to warn or alert Federal military, and civilian authorities, state officials and the civilian population, and all functions pertaining to communications including a warning network. These documents do not provide any stated time requirements for delivering the warning message. However, it is clear that the time available for warning is related to the threat.

2.4 CURRENT THREAT

Twenty years ago the primary threat was due to manned bombers or intercontinental ballistic missiles carrying nuclear warheads; the projected number of large nuclear weapons was relatively limited. During the past 10 years, however, the threat structure has changed. The era of nuclear plenty has made many smaller industrial and population complexes potential nuclear targets. Even more important, from the warning requirements outlook, is the advance in delivery systems capabilities. Increased accuracy is possible by new delivery systems; shorter delivery times are available due to such weapons systems as submarine launched missiles. As a result, the urgency for more rapid warning is apparent.

While there is no stated time limit for the delivery of the DCPA warning message, the DoD, Office of Surveillance and Warning Systems guidelines indicate a total of 30 minutes from earliest possible detection to impact for Intercontinental Ballistic Missiles (ICBMs) and for Submarine Launched Ballistic Missiles (SLBMs) the available warning time could be as little as 6 minutes.

2.5 DEFINITION OF THE WARNING PROBLEM

Warning is primarily a multidimensional function. In its civil defense application, the two predominant functions are alerting and informing. These functions are interdependent to the degree that they cannot be realistically considered in isolation. For example, an alert without an almost simultaneous definition of the danger creates fear, confusion, and can cause a crippling overload on the public telephone system with inquiring calls. Conversely, simply announcing a danger to the public, without an attention demanding alert, is less traumatic but also gives cause for doubt and is much

less effective in terms of responsive action and survival. Further, without an alert capability, there would be no way to call the warning message to the public's attention. Maximum effectiveness is achieved by a combination of alerting and informing.

A primary aspect of the warning problem is the mental attitude or conditioning of the recipient of the alerting signal or message. For example, in Europe during World War II, the air raid siren provided both an alerting and informing message to a trained population. They recognized the alerting signal, understood the impending danger it foretold, and knew the response they should make (i.e., take cover).

This situation does not presently apply in the United States. The population is not seriously concerned about the danger of nuclear attack. They are not generally aware of the meaning of different siren signals and they are not aware of what action they should take in the event of a warning of an attack upon the Nation.

This unpreparedness of the general American public (and non-civil defense related officials) has been demonstrated numerous times. Prime examples are the sounding of the civil defense alarms in Chicago after the Chicago White Sox won the World Series and the accidental and prolonged sounding of the civil defense siren in Concord, California in 1965. In both cases the public largely ignored the warning indications.

Thus, if a sudden attack were launched and the warning sounded, the results, from a civil defense aspect, would be highly unsatisfactory. However, the probability of such a surprise attack is very low. A more likely situation would be a build-up of international tension such as illustrated by the Cuban crisis. At such times, the public naturally pays more attention to the news, official announcements, and warning signals and is more willing to respond.

The present problem is a complex one, however. What does one do in the event of a warning of an impending nuclear attack on the Nation?

The danger to an individual can vary widely depending on his situation. A worker in the Pentagon or a resident in a prime target area obviously is in much

greater immediate danger than an isolated rancher in Idaho. However, the warning signal can mean basically the same to both persons.

1. Take cover rapidly
2. Find out more about the danger.

The immediate danger from nuclear blast, heat, radiation, and fallout outside of the impact area can be greatly reduced by responding to the warning and taking protective action such as using the shielding offered by man-made or natural cover.

The detailed follow-up information for the public would be handled, not by the NAWAS, but primarily by the Emergency Broadcast System (EBS) providing information over radio and TV. The recent incident at the Three Mile Island nuclear power plant clearly demonstrates the large amount of confusion that can result from a single incident involving nuclear radiation. The general public and untrained government officials cannot accurately assess the danger nor determine the proper protective actions required. Clear instructions from an authoritative source must be provided. In the event of a nuclear attack, where danger would be from blast and initial radiations as well as from fallout, the initial alert must be followed by clear and positive guidance.

2.6 WARNING REQUIREMENTS

There is no detailed quantitative or qualitative description of the requirements for the DCPA warning system. Neither are there stated performance requirements for the DCPA warning system. Therefore, the general mission and guidance function will be used as well as the implied or derived requirements.

2.6.1 General Warning System Guidance

The following extracted items provide guidance on the DCPA warning system required capabilities and performance.

1. As stated in DCPA Manual 5110.1, Organization and Functions, ". . . the Director develops and executes policies and programs which form the official guidance for federal, state and local governments in all aspects of civil defense preparedness. These include:

a. Civil Defense

(1) . . .

(2) . . .

(3) Steps necessary to warn or alert Federal military and civilian authorities, state officials and the civilian population of enemy attack upon the United States. Responsibility for developing, deploying and operating military surveillance and warning systems remains with the appropriate military department;

(4) Civil preparedness communications, including an appropriate warning network, communications between authorities, and communications procedures for the reporting on radiological monitoring and instructions to shelters; . . ."

2. As stated in DCPA Manual 5110.1, the Plans and Operations Directorate functions include:

"Office of the Assistant Director

1. ...

2. Directs the development and, as applicable, subsequent implementation of plans, policies, procedures and instructions for a wide variety of functions and programs, including but not necessarily limited to:

a. ...

b. A continuous 24-hour nationwide warning system;

..."

3. As stated in DCPA Manual 5110.1, the U.S. Army Communications Command Support Group (USACC) which provides certain communications support for DCPA, is assigned the following functions:

"FUNCTIONS

1. Operate and maintain on a day-to-day basis and emergency operation the Regional Communications Center and, as appropriate, the National Warning Center (Region 6) and the alternate (Region 2) to meet operational requirements.

. . ."

2.6.2 Warning Systems Organizational Relationship Alternatives

As noted in Paragraph 2.3, Executive Order 10952 requires the developing and executing of "all steps necessary to warn or alert federal military and civilian authorities, state officials, and the civilian population of attack or impending attack upon the Nation." This broad responsibility could be accomplished by the Federal government (DCPA) directly contacting the Federal military and civilian authorities, the state officials, local officials, and the general public. An example of such a system would be one where the Federal government sent the alert/warning message directly to home and business office receivers, as well as to appropriate civil defense related government activities. The Decision Information System (DIDS), described in Paragraph 4.2.6, is a system of this type.

The alternative approach is for the Federal government warning system to alert/warn the key Federal military and civil authorities and state officials. The function of alerting the general public would be accomplished primarily by the local officials who receive the warning notification by having a drop on the Federal network, a state network, or by fan out from a state or local activity. Both approaches are shown in Figure 2-1.

Either system could meet the general requirements outlined by the relevant directives and executive orders. The direct Federal approach could be accomplished in a simpler, more responsive manner. However, such a system bypasses the state and local officials, and it is the state and local officials that would be needed to direct local civil defense activities throughout the Nation. It also requires the public to procure their own home warning receiver unless the government wanted to supply them free, which is unlikely.

In the second approach, the Federal government meets its portion of a joint responsibility shared with the states, by ensuring that the states get prompt warning and that they have a suitable system to warn internal state and local officials and the general public. The Federal role is one of oversight of the program as well as providing planning, guidance, technical, administrative, and financial assistance.

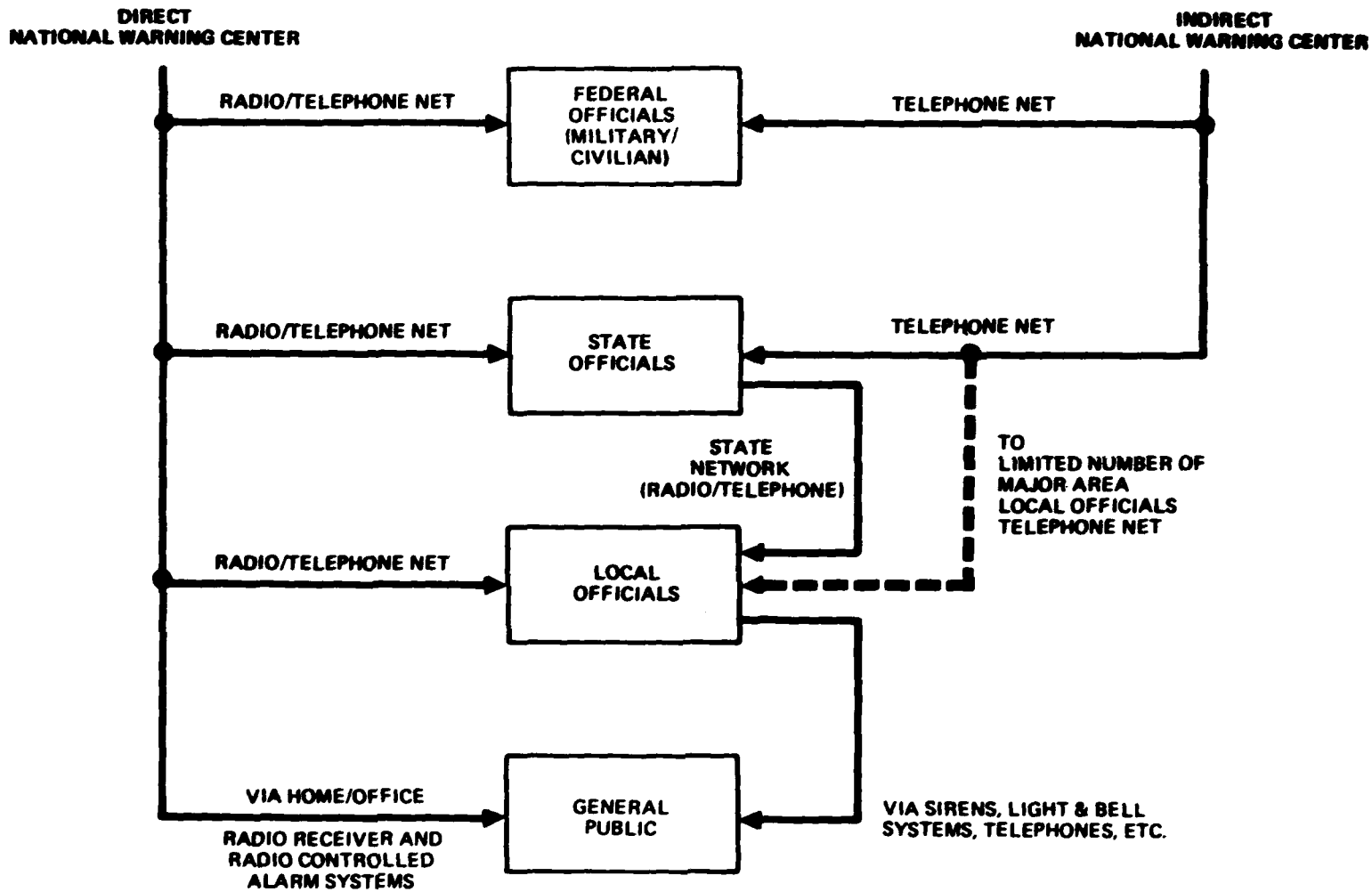


Figure 2-1. Alert/Warning Flow Pattern

The present warning system is a hybrid of the two alternatives. It is based on the indirect alternative with the addition of limited direct Federal coverage of the general public by means of the National Oceanic and Atmosphere Agency (NOAA) Weather Service Radio System. This is supplemented by the EBS which can relay warning information but has no specific alerting capability.

2.7 INTEGRATED WARNING SYSTEM

2.7.1 Background

In an effort to avoid proliferation of Federal warning systems, particularly those involving the general public home units, the Office of Telecommunications Policy (OTP) established an Interagency Warning Steering Group in December 1970.

In addition to OTP, the Steering Group included the following:

DCPA - responsible for attack warning

NOAA - an agency of NOAA, the National Weather Service (NWS), is responsible for disseminating weather warning information

Federal Communications Commission (FCC) - responsible for EBS rules and regulations relative to utilization of assets of the commercial broadcast industry in a national or local area declared emergency.

The Steering Group reviewed and evaluated six existing or planned home warning systems including:

1. DIDS
2. NOAA Weather Service Radio System
3. A Satellite Disaster Warning System
4. A telephone system
5., 6. Two systems based on home radio and television sets.

As a result of the Steering Group's effort, OTP, in 1971, issued a statement summarizing the results. The statement indicated that the DIDS system was the system most technically feasible for home warning. Studies and tests were

authorized. The first DIDS transmitter was not completed until May 1974. By then additional studies, including cost benefit studies were done and these showed the use of the NOAA Weather Service Radio System to be more cost-effective to the government and the public. In July 1974, the Interagency Warning Steering Group was reconvened for the first time since 1971 for the purpose of coordinating the warning dissemination function. By September 1974, the Group had agreed that DCPA and NOAA would work together to:

1. Use the NOAA Weather Service Radio System to augment DCPA's attack warning system
2. Develop procedures for the use of sirens for weather warning in conjunction with the NOAA Weather Service Radio system
3. Optimize plans to provide warning information to radio and television and networks.

This was confirmed in a January 1975 OTP policy statement that designated the NOAA Weather Service Radio System as the only Federally sponsored home warning system.

A Government Accounting Office (GAO) report "Need to Control Federal Warning System Proliferation," dated 9 April 1976 recommended in part that:

1. All Federal requirements for natural disaster and attack warning be defined and consolidated
2. An integrated national program to meet those requirements in the most operational and cost-effective manner be developed
3. Continued operation and further development, implementation or expansion of warning systems not needed for the integrated program be prevented unless their coexistence with such a program is formally justified for purposes other than warning.

2.7.2 Proposed Integrated Warning System Requirements

In February 1978, in support of an implementation plan for such an integrated warning system, DCPA prepared the proposed definitive listing of operational and performance requirements listed below.

"System Operational and Performance Requirements.

A. Coverage. The system shall provide an intelligible message to system receivers located within the 48 contiguous States. The warning system must be capable of interfacing with the local warning systems in the contiguous States and U.S. territories, and possessions. Intelligible voice message shall be available to:

99% of the broadcast stations and 90% of the population residing on 95% of the land area, 90% of the time.

B. Continuous Activation Capability. The warning system shall be capable of being activated any time of day, any day of the year. There must be a 24-hour capability to transmit an alert or warning message through each warning receiver, with at least 90 percent probability of receiving an understandable message the first time it is transmitted.

C. Minimum System Performance. The time availability of the circuits and equipments that provide warnings from the National Warning Center to individual broadcast stations and government offices shall exceed 95%.

D. System Response Time. The time from initiation of a warning at the national initiation point to the start of reception of the warning message at all broadcast stations shall be less than one minute.

E. National Initiation Points. The system shall be capable of activation on a nationwide basis from either of the two Defense Civil Preparedness Agency (DCPA) National Warning Centers (NWC). Control of the system on a national basis shall be provided only at these centers.

F. Priority of Attack Warning. The NWCs will have the capability to preempt any other transmission in order to transmit an attack warning.

G. Message Types. The warning system shall be capable of transmitting voice messages.

H. Alerting Signal.

1. An alerting signal, independent from the signals used to turn on the warning receiver, shall be transmitted to draw attention to the warning message. It shall also be possible to transmit information or tests without transmitting the alerting signal.

2. The alert signal for the warning system shall originate in the transmitting elements of the system, not in the warning receiver itself.

I. Addressing. The warning receiver terminals in government offices and broadcast stations and the associated controlling transmitters shall be designed so that receivers can be automatically and selectively turned on as follows:

1. For attack warning, all warning receivers may be turned on simultaneously.

2. For impact warning, all warning receivers in any one of 100 or more predesignated local target areas may be turned on.

3. For dissemination of essential emergency information, addressing flexibility shall be provided for turning on the warning receiver at civil government, industrial, institutional, and military facilities.

J. **Warning Message Options.** The warning system shall transmit pretaped warning messages to the public whenever practicable. The equipment provided to local officials and broadcast media shall be capable of relaying live messages, if desired and effected by local authorities.

K. **Flexibility.** The system shall be separable into local and regional configurations to provide for dissemination of local disaster warnings and emergency public information.

L. **Verification of Activation and Operational Status.** Verification of the performance of the transmitting elements of the system shall be given to the Federal official at each national initiation point. The operational status of the system -- the test or attack warning actions taken at either of the national initiation points -- shall be instantaneously displayed at the other initiation point.

M. **Spoofing and Unauthorized Access.** The warning system shall be designed to enable the rapid detection by local system operators of any such attempt. The system operators shall be provided with the ability to immediately interrupt false alerts and inform the public of the situation.

N. **Inadvertent or False Activation.** Signalling used to automatically turn on warning receivers shall minimize inadvertent or false activations. Normal transmissions of the broadcast stations shall not cause the tone alert receiver to falsely activate more than once a year.

O. **Receiver Requirements*.** The warning receiver shall operate and furnish an intelligible message, following appropriate turn on signals, with 99.9 percent probability. Receiver locations not equipped with emergency power shall operate for at least 48 hours with a 25% audio on duty cycle in the absence of commercial power.

---

* For Government purchased receivers.

P. Activation of Other Systems. The warning system shall be capable of effective and timely activation of local outdoor warning sirens and other public alerting and warning systems, if desired and effected by local authorities.

Q. Testing. The complete warning system, including the home warning receiver, shall be tested on a regular basis in a manner that will not interfere with real-time warning messages. Tests going into homes must be unobtrusive.

R. Fail-safe Equipment. All equipment in the warning system shall be designed to maximize the probability that components will not fail except in a silent or safe condition, and will not fail in a condition that gives a false indication of system operation.

S. Standby Equipment. Warning system circuits shall be furnished with standby equipment and communications circuits when the mean time to repair exceeds four hours. Where standby equipment is unattended automatic or remote controlled switchover to standby equipment shall be provided.

T. Maintenance. The failure of equipment used in the transmitting elements of the system shall be indicated automatically to the responsible maintenance personnel. Where such failures degrade system operation, the Federal official at each national initiation point shall be notified."

No official action has been taken or is under way to establish these requirements or a modified version as approved requirements.

These proposed requirements, which are in general consonance with established guidelines and directives, will be used in evaluating the warning systems.

SECTION 3 - DCPA WARNING POLICY

3.1 GENERAL

DCPA Manual 0001.1, "Policy Papers" is the single document source for the promulgation within DCPA of DCPA policy. This document includes all internal policies established by the Director, DCPA and also an index of the most important documents containing policy statements issued by "higher authority" and directive upon DCPA.

A review of current policies relating to DCPA's warning mission and functions was conducted and is discussed below.

3.2 CURRENT DCPA WARNING POLICIES

The basic policy for the alerting and warning program is as follows:

> "It is the policy of DCPA to develop and maintain a capability to provide warning of an impending or actual enemy attack upon the United States to Federal military and civilian authorities, and the civilian population." (DCPA Policy Paper 5-1-0-01).

The cited authority for this policy is the Federal Civil Defense Act of 1950, as amended. Note that this does not mention providing warning to the state or local officials as related mission and function documents do.

3.2.1 Federal Support of State and Local Civil Defense Programs

In recognition of the vital role that state and local governments play in civil defense, the Federal government policy is to provide support for their internal programs. Support is provided in the form of technical, operational, and financial guidance and assistance. This includes DCPA assistance in developing and maintaining plans and procedures to cope with emergency situations arising from an impending or actual attack on the United States.

This financial assistance is the major factor that tends to unify the civil defense effort. DCPA Policy Paper G-1-A-04 defines the requirements for participation in all DCPA financial assistance programs. To obtain financial assistance, the state Civil Defense Agency must have a full-time director or a full-time deputy director. Further, state and local civil defense agencies must have a current DCPA approved civil defense emergency operations plan that is consistent with Federal guidance. It is this control of the purse strings that puts DCPA in a position where it can influence and regulate the civil defense activities of state and local governments desiring financial assistance.

The financial assistance provided to the state and local governments can be used to assist in covering the costs of personnel, material, and services required for DCPA approved civil defense plans. Further, items such as warning equipment, purchased by a state or local government with the assistance of Federal funds, may be installed in a private institution such as a school or hospital which is responsible, under an approved civil defense plan, for warning its students, patients, and others. (Policy Paper G-1-C-05).

3.2.2 Support of Other Than Attack Situations

The legal authority for Federal assistance under the Federal Civil Defense Act is based on civil defense needs and responsibilities to prepare for an attack upon the United States. However, the Federal government recognizes the need for dealing with peacetime emergencies such as natural disasters. Hence, in accordance with Public Law 94-361, the Federal, state, and local civil defense organizational structure can be utilized to provide relief and assistance to people in areas of the United States struck by disasters other than disasters caused by enemy attack, providing this does not affect the basic civil defense objectives.

Accordingly, DCPA Policy Paper G-1-A-02 states that all resources including personnel, facilities and equipment, when established within state or local government civil defense services, will be considered to have a secondary application for other than enemy caused disasters.

The utilization of civil defense resources for their secondary mission may be considered when developing civil defense plans. (DCPA Policy Paper G-6-0-03).

3.2.3 Alerting and Warning Program Policies

In addition to the policies outlined above, there are several policy papers directly relating to the Alert and Warning Program which are addressed below.

1. Policy Paper 5-1-0-02 specifically states all Federal and Civil Defense warning systems may be utilized or made available to Federal, state, or local agencies for warning the civilian population when endangered by disaster

2. Policy Paper 5-1-0-04 encourages and supports the integration of state, county, and local communications and sound systems and other alarm devices into the national Civil Defense Systems

3. Policy Paper 5-1-0-03 tasks DCPA with operating and maintaining a separate attack warning system for the Washington, D.C., metropolitan area.

3.2.4 Emergency Public Information

DCPA recognizes the vital role that the media plays in providing information to the general public. DCPA policies clearly support this position as evidenced by the following:

1. Policy Paper 7-2-0-01 states that the basic policy with regard to emergency public information is for DCPA to assist all levels of government in providing a capability to disseminate emergency information and instructions to the public before, during, and immediately following an attack on the United States. This includes warning of the emergency instructions on action to be taken, possible effects of the emergency, and data on individual protective measures that should be taken

2. Policy Paper 5-1-0-05 states that DCPA will support the broadcast industry in their assistance to all levels of government in broadcasting warning information to the public

3. Policy Paper 7-4-0-01 more specifically states that it is the policy of DCPA to provide assistance to ensure a continuing operational capability for selected emergency broadcast stations. These stations will provide the President and Federal, state, and local officials the means of reaching the general public with official emergency information under nuclear attack conditions. DCPA, in coordination with the FCC and other Federal, state, and local agencies, will assist in the development and review of EBS state and local plans.

3.2.5 National Policy for the Use of Telecommunications to Warn the General Public

As discussed in Paragraph 2.7.1, a very significant policy affecting the disseminating of civil defense or other disaster information to the general public by home receivers was made by OTP, Executive Office of the President in January 1975. (Due to reorganization, OTP no longer exists, but the relevant missions and functions were transferred to the Department of Commerce.)

In 1971 the Federal government established a national policy with respect to home warning systems, stating that the acquisition and use of any warning receiver would be a voluntary decision by each citizen.

Between 1971 and 1975 studies regarding the use of home receivers were made. This resulted in a reaffirmation of the previously stated policy regarding the voluntary nature of acquisition and use of a home warning receiver. Further, the policy was established that there would be a single government-operated system for warning citizens in their homes of enemy attack or natural disaster.

The two primary alternative systems considered were the DIDS, sponsored by DCPA, and the NWS VHF/FM tone alert system. The NWS is an agency of the NOAA.

The policy was established and is still in force that the only Federally sponsored radio transmission of warning information to home warning receivers would be by the NOAA Weather Services Radio System.

OTP gave the following as its reasons for the choice of the NOAA Weather Services Radio System:

1. It provides routine daily weather services, tailored to local areas, thereby enhancing the marketability of receivers
2. Federal investment required to complete coverage of most populated areas will be much less than the investment required to complete the DIDS transmitting system, and can be accomplished much sooner
3. Inexpensive commercial receivers for this system are already on the market.

3.3 SUMMARY

DCPA has established and promulgated policy covering the many aspects of their civil defense mission.

Specifically, with regard to alert and warning, the policies have been established to have DCPA oversee and support a joint Federal, state, and local system with DCPA providing financial assistance for approved plans. The primary purpose of this system is for alert and warning relative to impending or actual enemy attack. However, the resources of the civil defense system are available for use in the event of disaster due to other-than-enemy attack, providing there is no interference with the primary civil defense objective.

Lastly, unless changed, the current national policy designating the NOAA Weather Services Radio System as the only home warning system can greatly impact future modifications or redesign of the Civil Defense Warning System.

SECTION 4 - ASSESSMENT OF THE BACKBONE WARNING SYSTEM

This section evaluates the capabilities of the existing and potential warning systems to determine the degree to which they can distribute warning information from the National Warning Centers at Cheyenne Mountain, Colorado, and Olney, Maryland, to state and local governments. The following assessment will consider the hardware, manpower, and procedural components of these systems as well as the survivability. First, existing operational warning systems including NAWAS, the AP/UPI radio news wires, the NWS, and the EBS will be considered. Then systems which, in recent years, have been devised and implemented to the degree necesary to be tested, to determine wether any aspect or concept involved with those systems would merit further consideration will be considered. Finally, new concepts and systems will be discussed and evaluated.

4.1 DEFINITION OF THE BACKBONE SYSTEM

The backbone system is defined as that dedicated network extending from the National and Alternate National Warning Centers (NWC and ANWC) to interface with the state and local warning systems. Backbone warning circuits are used to give general or selective warning of impending crisis, attack, accidental missile launch, natural disaster and the like to regional, state, and local control centers. The backbone system is also intended, to the extent possible, for use during and after the immediate crisis to coordinate emergency action. The backbone of the existing warning system consists of four-wire voice circuits leased from AT&T and configured into a number of party lines, as described in detail in Paragraph 4.2.1. However, a backbone system could be configured differently and might consist of radio links interconnecting the same Federal, state and local warning centers; or, it could consist of communications circuits superimposed on power distribution systems, CATV links, broadcast station networks, or combinations of two or more of the above.

4.2 EVALUATION OF EXISTING AND PAST SYSTEMS

No attempt is made to describe each existing or previously considered backbone system in full detail. Rather, selected systems will be identified and their major characteristics briefly delineated as a basis for evaluation.

4.2.1 NAWAS

The existing NAWAS is a dedicated voice network of warning and control circuits and switching and control facilities leased from AT&T. Under the lease agreement, AT&T also furnishes the support of various Bell System operating companies and independent telephone companies. The network is of the Selective Signaling System type (SS-1) and provides simplified two digit dialing to interconnect all or parts of the network.

4.2.1.1 NAWAS Hardware/Facilities

The NAWAS network connects many warning points in large party-line configurations. Figure 4-1 is the general configuration of the network covering the 48 contiguous states and Alaska. It shows the NWC and ANWC, the eight numbered Federal Regional Centers (FRCs) and state warning point locations. The heaviest lines are regional boundaries. The medium lines depict the national backbone circuit. The light lines represent state fan outs to Federal and state warning points. As depicted, the NWC is collocated with the Northern Air Defense Command Headquarters (NORAD) at Cheyenne Mountain, Colorado, and the ANWC is collocated with DCPA Region 2 Headquarters at Olney, Maryland. The eight DCPA FRCs are located as follows:

DCPA Region	FRC Location
1	Maynard, MA
2	Olney, MD
3	Thomasville, GA
4	Battle Creek, MI
5	Denton, TX
6	Denver, CO

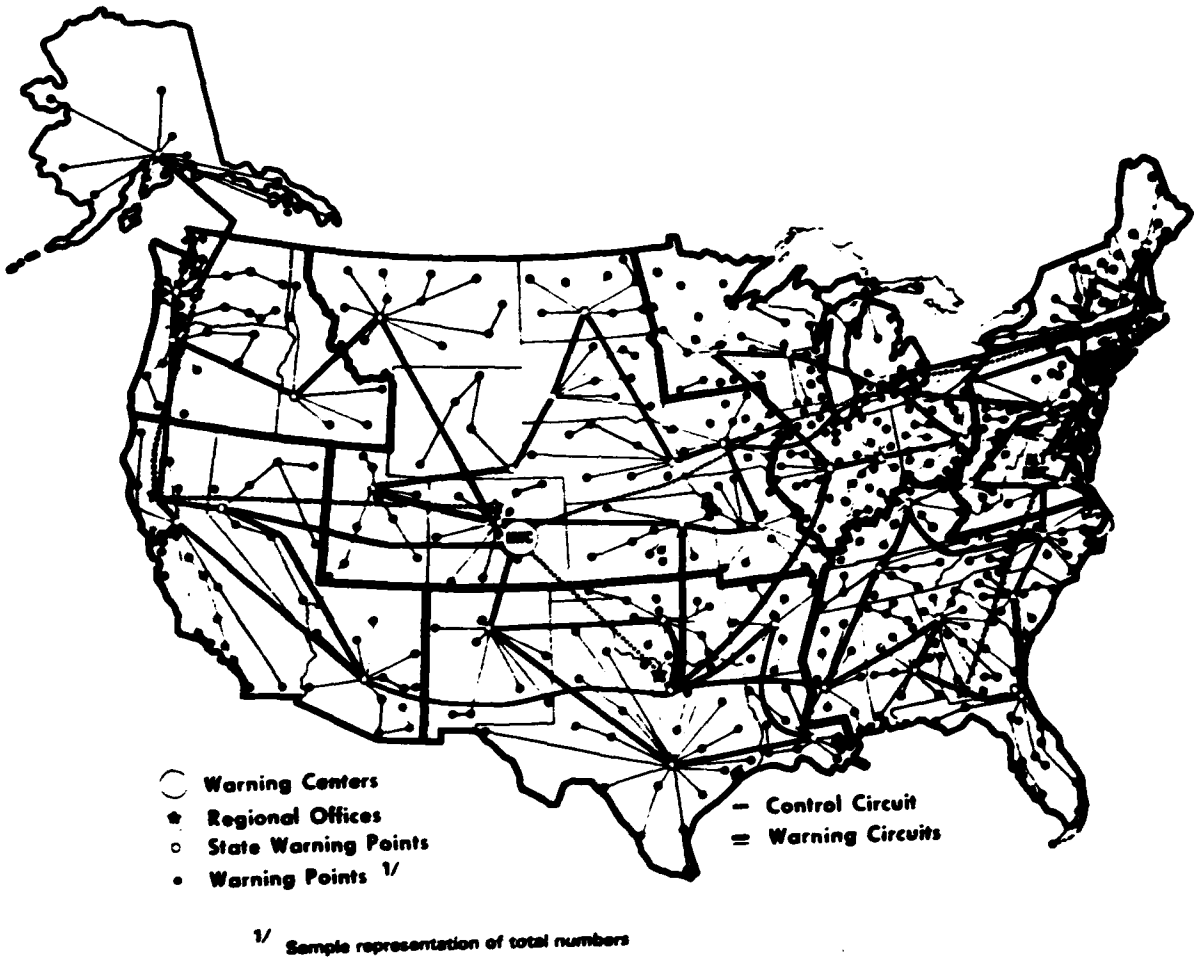


Figure 4-1. National Warning System (NAWAS)

DCPA Region	FRC Location
7	Santa Rosa, CA
8	Bothell, WA

In addition, there are over 100 Federal warning points, 49 primary state warning points, and many subsidiary state and local warning points shown. All in all, over 2300 terminals are connected on the control and warning circuits at over 1900 physical facility locations. According to AT&T, the system is now near the upper limit of what can be done with party lines, without reengineering processes.

The NWC, ANWC, and six of the eight FRCs are hardened facilities as are their primary and alternate communication cables out to the first main switch point serving each center. For example, the Region 2 cables are hardened out to the Monrovia switch. The Region 4, Battle Creek, Michigan, and Region 7, Santa Rosa, California, facilities are not hardened. The NWC and ANWC are voice drops on the NORAD alert system, which is how they would receive the word to issue the warning message.

The control circuit is a four-wire, full-duplex circuit. It is used to transmit the SS-1 signals for remote switching, to coordinate NAWAS operations, and to pass administrative traffic. The control circuit interconnects the circuits serving the key activities throughout the country shown in Table 4-1 using their SS-1 code designators. Figure 4-2 is a schematic of this control circuit.

Some of the control circuit parties in Table 4-1 are at administrative locations and oversee day-to-day operations. They also supervise any transition from routine to emergency conditions. Others are at relocation centers and emergency operation centers. AP and UPI receive attack warning information for dissemination over their news wires for use by radio and TV networks and broadcast stations.

Figure 4-3 depicts the NAWAS warning circuits which interconnect the eight regions. There are also 64 state warning circuits. These are all four-wire, full-duplex circuits. Each state has one state circuit except for

Table 4-1. NAWAS Control Circuit SS-1 Codes

GP-8246

CONTROL CIRCUIT TERMINALS

LOCATIONS	SS-1 CODE
Director, DCPA, Pentagon	05
DCPA HQ OC	03
ASST. DIR, DCPA, PLAN & OPNS	06
FPA WASHINGTON, D.C.	25
BLUE RIDGE SUMMIT, MD.	08
FORT MC PHERSON, FORSCOM	28
DCPA REGION PBX REG-1	23
REGION 1	22
REGION 2	32
REGION 3	42
REGION 4	52
REGION 5	62
REGION 6	72
REGION 7	82
REGION 8	92
NATIONAL EARTHQUAKE INFO SERVICE	73
7th SIGNAL COMMAND, OPERATIONS	09
CARLISLE BARRACKS	20
AIR FORCE RESCUE & COORD. CTR	56
RADFORD, VA (Computer Site)	43
NATIONAL WARNING CENTER	00
ALTERNATE NATL WARNING CTR	24
NEWS AGCY TERMS (COMM SS-1 CODE)	95,97,99
UNITED PRESS INTERNATIONAL, CHICAGO, IL	
ASSOCIATED PRESS, NEW YORK CITY	
CBS NEWS, NEW YORK CITY	
MUTUAL BROADCASTING SYS., ARLINGTON, VA	
NATIONAL PUBLIC RADIO, WASHINGTON, D.C.	
ABC-RADIO NEWS, NEW YORK CITY	
ABC-TV NEWS, NEW YORK CITY	
NBC, NEW YORK CITY	
PUBLIC BROADCASTING SERVICE (TV), WASH.D.C	

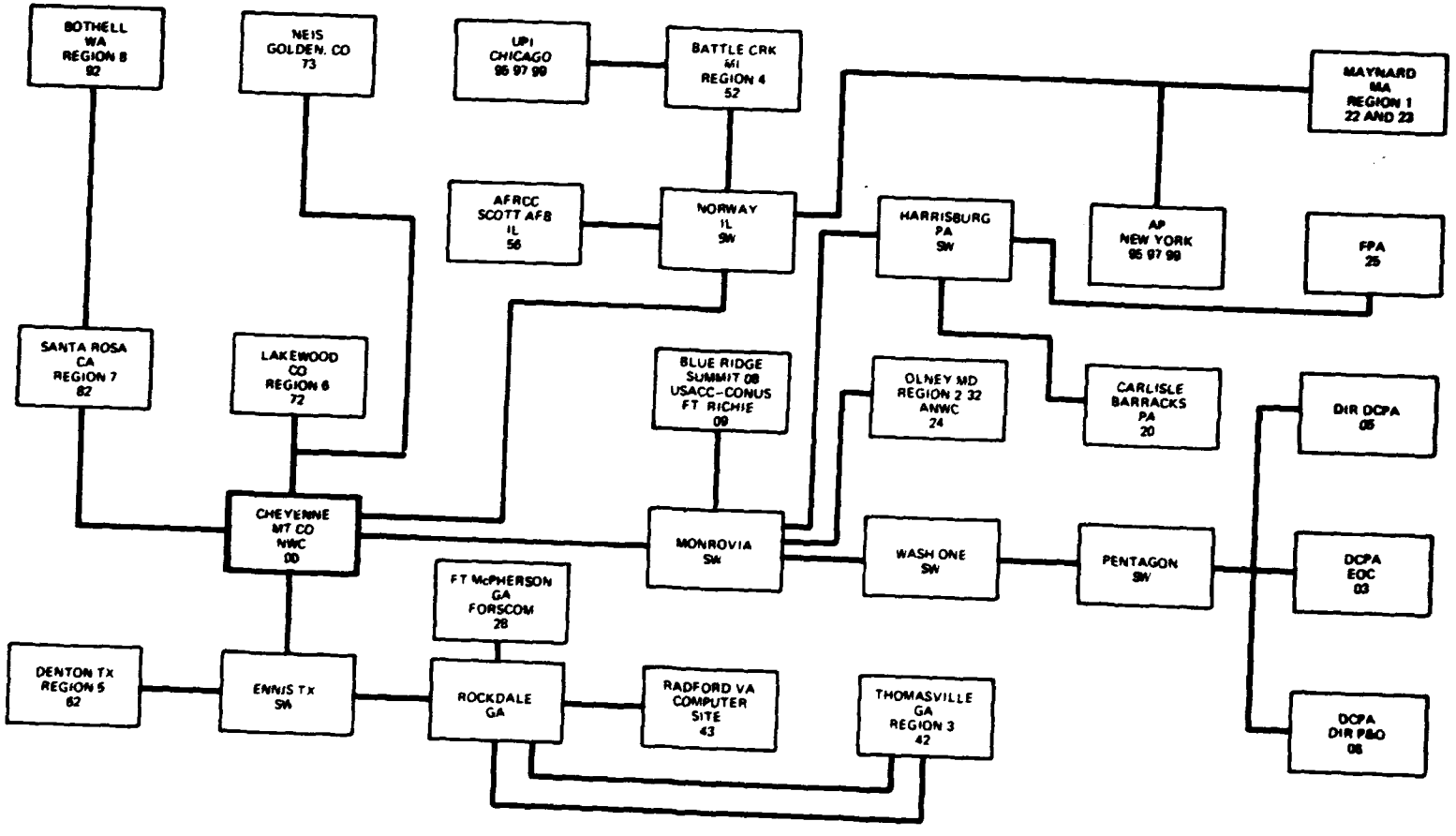


Figure 4-2. Schematic Diagram of Control Circuit GP-8246

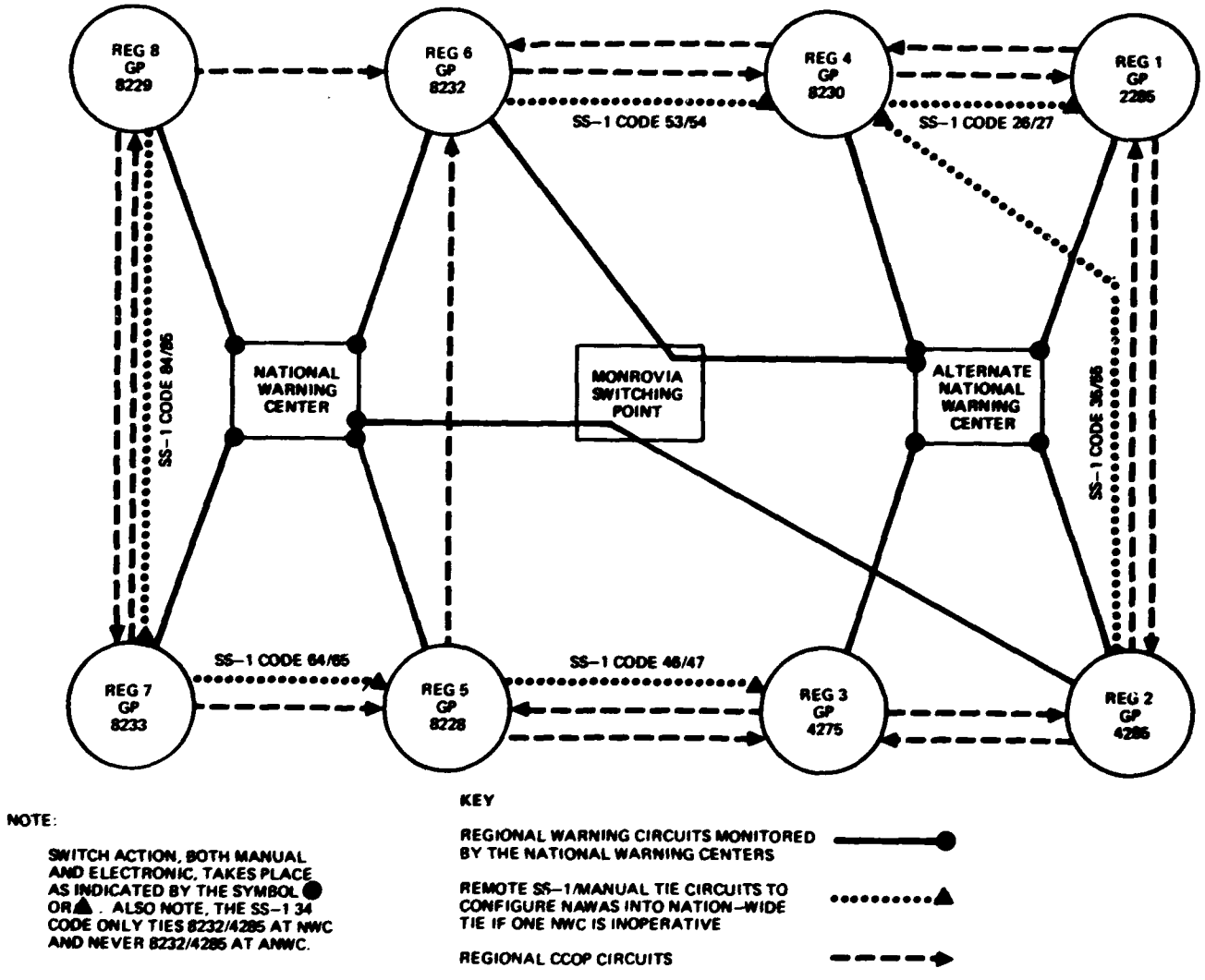


Figure 4-3. Schematic Diagram of the National Warning System Regional Circuit Interconnections (Less Control Circuits)

Texas, which has two circuits and New York, which has 14 circuits. Each regional circuit interconnects all states in its region. As a minimum, each state has a primary state warning point on its regional circuit; most also have their alternate state warning point as well as such facilities as the state emergency operations center, civil preparedness headquarters, capitol, and governor's mansion.

Tied into NAWAS is the Washington Area Warning System (WAWAS) for Washington, D.C., metropolitan areas. WAWAS is a system of sirens, bells, and lights and has leased lines for activating these facilities by control signals. It has UHF radio for voice communication. The ANWC at Olney, Maryland, is the relay point and is in positive control. All subscribers to the UHF system must call Olney for relay switching through the repeater. The subscribers are police, fire, emergency squads, etc.

The Figure 4-3 schematic shows all eight regional warning circuits monitored by the NWC and ANWC. The circuits can be switched manually or electronically and remotely by SS-1 codes. DCPA Continuation of Operations (COOP) circuits are shown indicating a back-up capability of each region. The SS-1 signals for remote switching go via the control circuit, which was shown in Figure 4-2.

4.2.1.2 Manning and Procedures

The NAWAS is operated for DCPA by Department of the Army, USACC personnel. The personnel at the NWC at Cheyenne Mountain, Colorado, and at the ANWC at Olney, Maryland, are under the civilian personnel office of the 7th Signal Command at Fort Richie. Funding for the Army to pay the personnel is provided by DCPA.

In addition to the exchange of voice messages for network intelligence (command and control), as stated above, tone signals are also transmitted over the control

circuit. These signals actuate switching devices, which control national and regional circuit configurations. Through the use of these signaling techniques, either NWC, or both of them together, can exercise control over NAWAS and disseminate a warning over it. Usually, circuits are switched remotely using the SS-1 codes; however, if this fails, the circuits can be switched manually by regional personnel. The regional circuits are usually kept separated until a test or real warning occurs. At this time the circuit will be configured by SS-1 codes (or manually) as required (national or regional) for the situation.

A real or simulated warning (test) will originate either at the NWC or ANWC and will go through each region and state primary and alternate warning point to the local warning centers within each state. A national roll call will be answered by each state. After this is completed, the operator at each state primary point will push a foot switch which disconnects in-state transmissions from the national network. The state operator will then call the roll of the local warning points. If any point on the roll call fails to respond, an attempt will be made to contact that point over back-up facilities such as the public telephone system or state radio system. Under normal peacetime conditions (no disaster) any circuit failure within a state which cannot be resolved within 4 hours is reported to the NWCs.

The ANWC takes over from the NWC or vice versa if one or the other fails. If the NORAD facility at Cheyenne Mountain, Colorado, is out of service, the Alternate Command Post (ALCOP) at Malmstrom Air Force Base, Montana, takes over and provides the warning notification to the NWC and ANWC.

With the party line interconnections established, the entire backbone network can receive the warning simultaneously. Eight of these party line circuits exist--one for each of the eight regions--plus a national control circuit. Using the control circuit, the NWC and ANWC have the capability of operating the eight regional circuits together or separately in various combinations as described. On the other hand, each of the eight regional centers is limited to controlling its tie-in only to one or more adjacent regions.

The primary state warning points are manned on a 24-hour basis and in most cases, are located at state police headquarters, state highway patrol headquarters, or a similar facility that provides full time coverage. The alternate state warning points are frequently located in the state emergency operations center or at state civil preparedness agency headquarters and are manned only during business hours or on an emergency basis. (If the business office and the emergency operations center are separate facilities, there are usually NAWAS drops in both locations.)

The NWC and ANWC keep multiple digital 24-hour clocks set to local time zones within the network so that any alert given to a special regional area can quickly reference local time just by reading that clock. For example, a warning of an accidental missile launch, either foreign or domestic, can be given to the projected impact area with an estimate of the affected area size with the predicted local time of impact, within a few seconds of the receipt of this information from NORAD. Maps are maintained for quickly plotting the location of impact and area of fallout to include follow-on warning messages.

The NWC and ANWC monitor unusual situations which could develop into emergencies, such as civil disorders, approaching storm conditions, overdue aircraft, and the like. At the discretion of the duty officer, the assistant director of DCPA for plans and programs is kept informed of these developments by telephone, day and night.

On 16 August 1978, a typical practice nationwide test of NAWAS conducted by the NWC produced the following result, as monitored at the ANWC.

Shortly before 1200 hours the NWC configured the NAWAS into total interconnectivity nationwide and announced, "stand by for the warning test." At precisely 1200 hours the warning test was effected by voice message. All regions responded to the roll call within 30 seconds. The states then conducted their own roll calls. All states reported roll calls complete within 1 minute and 20 seconds. The warning was therefore verified complete in 1 minute and 50 seconds to all operational state warning points on the network. The only deviation from a perfect test was a slight

delay in response by Region 1 which missed the regional roll call the first time around but came in at the end, within the 30 seconds quoted above.

4.2.2 The AP/UPI Radio News Wires

As stated earlier, AP and UPI are on the NAWAS control circuit. They can receive attack and disaster warning information for dissemination as a news item over their radio wires to radio and TV networks and broadcast stations. As can be readily seen from the control circuit terminals in Table 4-1, the major broadcast networks are also on the control circuit. The major broadcast stations receive warning information via their NAWAS drops and also via their AP and UPI radio wires. There is, therefore, good assurance with this redundancy, that a maximum number of broadcast outlets will receive prompt notification of the warning. In addition, AP/UPI are interconnected with the emergency broadcast system. For discussion of this, see Paragraph 4.2.4.

There is, of course, a manual interface at the AP and UPI centers. This involves transcribing of the voice warning received via NAWAS to a teleprinter message for transmission over the radio wires.

4.2.3 The National Weather Service (NWS) Radio System

4.2.3.1 NWS Hardware/Facilities

NOAA, an agency of the Department of Commerce, has established a network of VHF weather radio stations to disseminate warning of environmental hazards to persons in threatened areas. These are operated by the NWS. Approximately 340 NWS stations are planned and are being implemented. More than 330 should be operational by the end of 1979. These stations will cover the geographical areas where 90 percent of the population would live and work under normal peacetime conditions. Figure 4-4 shows the geographical layout of the network.

Reception of the warning messages by the general public is on a specially designed receiver, procured on a voluntary basis by the individual. The receiver can be demuted (activated to sound an audible alarm) by a coded tone signal from the

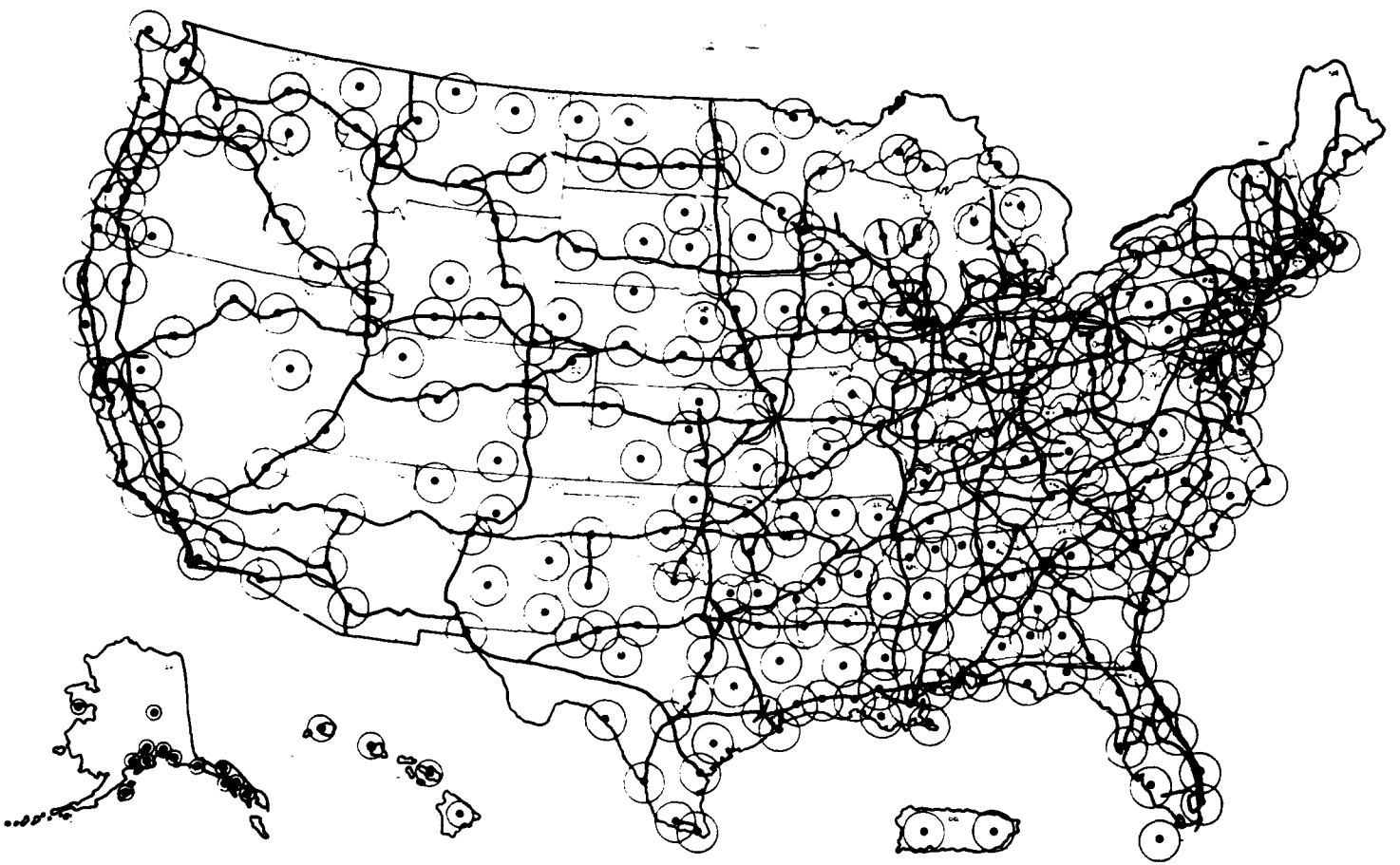


Figure 4-4. NOAA Weather Radio Network

NWS transmitter network. Following the sounding of the alarm, appropriate voice warning data, including instructions, can be received.

Figure 4-5 is an actual ad taken from a recent newspaper advertising a weather receiver, on a local basis, for the Sacramento, California area, at a price of approximately $40. Reception at a range of 40-50 miles from the weather transmitter, as claimed, would depend upon the path since VHF is basically line of sight.

The stations operate in the frequency range of 160-165 MHz at fairly high power, in the range of 300 to 1000 watts. The stations are located for optimum coverage of the required population.

A measure of selective calling is provided by five different tone bursts which allow unique addressing of up to five groups of receivers and networking them by tone demuting.

A program called Automation of Field Operations and Services (AFOS) is being implemented which should improve warning time over the NWS Radio System for natural disasters. AFOS is discussed in paragraph 4.3.1.4.2.

4.2.3.2 NWS Manning and Procedures

If no hazard exists, the stations broadcast information on routine weather conditions. When hazardous conditions threaten or prevail, emergency warning information preempts the routine broadcasts. Both warnings and routine broadcasts are tailored to conditions existing in the coverage area of each station. The NAWAS network serves 281 weather service locations, 267 of which are manned 24 hours a day. The NWS system will also relay any attack warning received. Thus, these weather service locations and their control and program links to the NWS VHF radio stations can be considered supplemental or a potential alternative backbone system for the NAWAS. In the present system, the warning received from NAWAS would either be taped and then broadcast or it would be repeated verbally. Depending upon the time to demute the weather receivers and the length of the warning information, this procedure could take up to 1 minute to relay the warning.

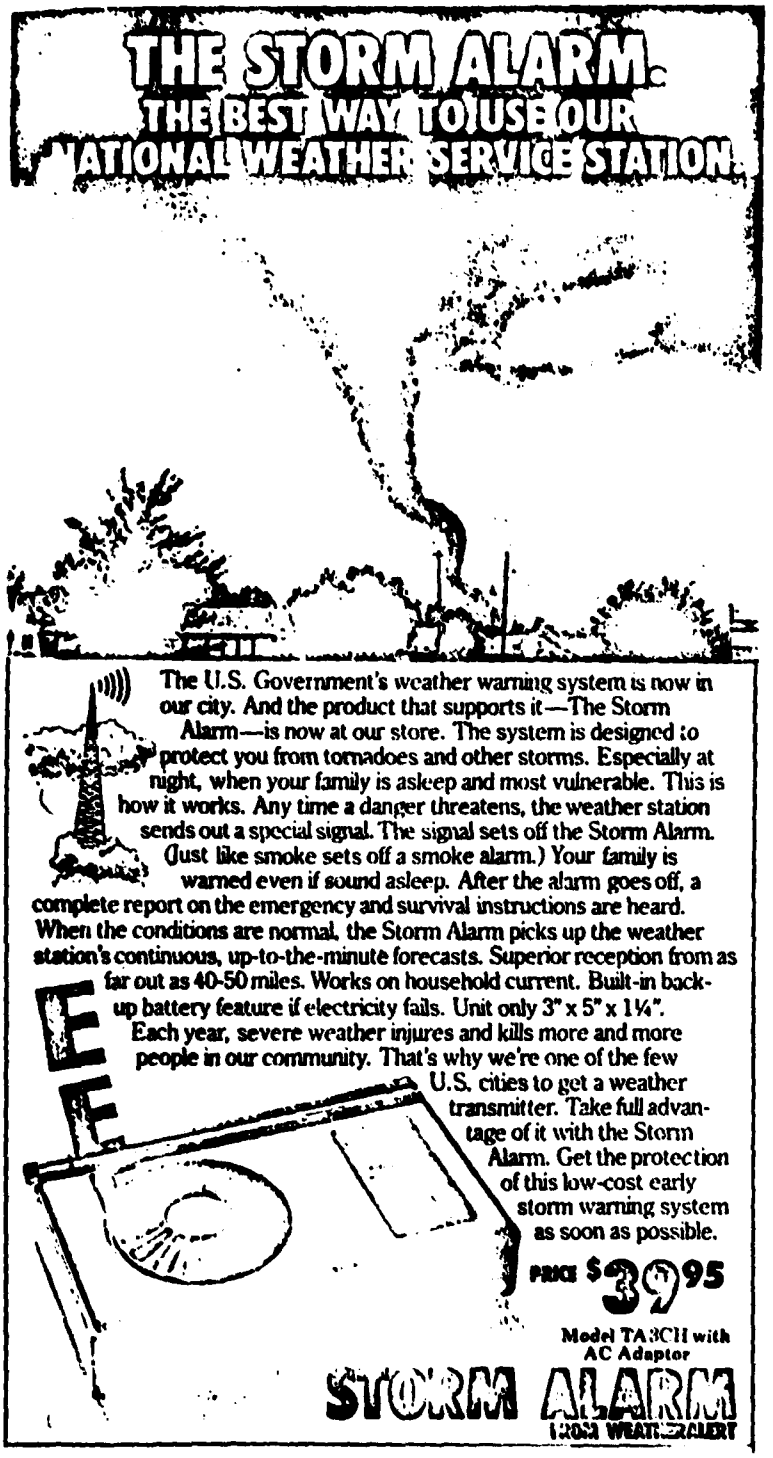


Figure 4-5. Advertisement for an NWS General Public Weather Receiver

The overall effectiveness of this system, however, for attack warning is questionable because it covers existing population concentrations, which, under such a crisis situation, may be evacuated. The VHF coverage would be adequate to warn at most, 90 percent of the population unless the system were reoriented or augmented by many more VHF stations, to cover the dispersed population. An alternative to this is a satellite type of system, discussed in Paragraph 4.3.2, which could double as an NWS Disaster Warning System facility and a national warning system for DCPA.

4.2.4 The Emergency Broadcasting System (EBS)

The EBS provides an operational capability for local, state, and national (including regional) units of the government to communicate with the general public within their respective jurisdictions. The EBS provides the means to utilize many of the facilities and personnel of the non-government communications industry, on a voluntary basis under appropriate government regulation and in a controlled manner consistent with security requirements, during a local, regional, or national emergency.

The EBS does not provide an inherent alerting capability unless the receiver is in use at the time the warning requirement occurs. However, it is an excellent supplementary system for disseminating and amplifying warning messages and instructions. For example, a siren can alert the public and cause them to turn on the radio or TV to obtain information and instructions. There are many hours per day when the EBS would be the system that accomplished both the alerting and warning functions such as when flash announcements would be made as many of the public were watching/listening to the TV or radio. Additionally, there are commercially available, demutable receivers that are activated by a two-tone signal transmitted by EBS prior to broadcasting the warning. The use of these receivers by government and private institutions and the public is growing.

4.2.4.1 Description

Major elements of the EBS consit of the radio and TV networks and stations, the AP/UPI radio wires plus three control circuits as well as the procedures to place warning and crisis/disaster instructions and information at the disposal of the public. The three control circuits are:

1. A voice circuit - the "300" net

This circuit serves several points including AP, UPI, and NORAD and is used to confirm the authenticity of EBS activation and termination, by means of voice code words

2. A dedicated multipoint teleprinter circuit - the "500" net

This circuit is activated by either an Air Defense Command (ADCOM) or the Federal Preparedness Agency (FPA) origination point on order of the President or the White House Communications Duty Officer. Receive only (R/O) teleprinters at 15 to 20 locations including control points at AP, UPI, radio and TV networks and participating common carriers are turned on, alarm bells and lights are activated, and notices to activate and later terminate the EBS are sent by printed message, authenticated as above (item 1)

3. Two voice circuits

These circuits are linked together and to WDVM and to the Network Radio New York distribution point of AT&T. They are used to input a voice message into the EBS. The two voice circuits can be split and used separately; however, if there is an unintentional break in the link an alarm will be set off at the control point.

4.2.4.2 EBS Local Facilities and Procedures

The EBS facilities in local operational areas can be activated by designated local, state, or Federal officials for emergencies under certain circumstances. Such activation is covered by local area plans which may cover a state or part of a state such as a city, county, or a group of adjacent counties. Local area facilities feeding information to various radio stations can include National Weather Service Forecast Offices and the police, both of which may have NAWAS drops. With action coordinated by a county EOC, information to guide the public through a crisis situation would then be disseminated through AM, FM, and TV broadcast stations, CATV, and any available special facilities such as MUZAK circuits.

4.2.5 Telephone System Alternatives (AT&T)

AT&T has studied methods for providing an alerting system based on use of the omnipresent telephone. The basic idea for such systems is to automatically ring all telephones with a distinguishable sound and to provide an appropriate recorded warning message. It is not technically feasible to ring all phones simultaneously, but large blocks of phones could be rung in rapid succession.

AT&T has not been enthusiastic about using such telephone systems to give a general warning because of the interruption to all of the on-going service (including critical calls) which would occur during the warning. Further, it would be extremely difficult to reestablish essential calls after the warning was issued. They feel that long delays could result in returning service to normal due to phones left off hook and abnormal traffic loading by individuals who would be at the phone, calling to discuss the warning and planned actions with others. On top of this, there would be disruption of normal service every time a full test were conducted. However, AT&T has developed and offers special alerting systems to small communities of users.

4.2.5.1 Bells and Lights

This system can be installed on any telephone exchange and requires a special dial-activated sending net at a selected location and receivers at locations desired by subscribers. Any of four signals may be dialed with each signal causing a specific colored light to flash at the receiving sets: red, yellow, white, or blue, accompanied by an audible bell signal. It does not require a voice circuit, only a less expensive control circuit. This system is now being used to alert special offices and officials in the National Capital area as part of the WAWAS.

4.2.5.2 Group Alerting Systems

Another system developed by AT&T is a Group Alerting System permitting up to 500 subscribers to be called simultaneously from one control location. However, this again is limited in coverage and must be restricted to key individuals and locations, since the telephone system cannot activate all subscriber lines at one time.

4.2.6 The Decision Information Distribution System (DIDS)

For about 10 years a backbone warning system called the DIDS has been under consideration. A prototype system was built and tested successfully but implementation was stopped due to the 1975 OTP policy statement that the only Federal warning system to home receivers would be the NWS system.

Since DIDS is a one-way broadcast system using low frequency (LF) radio, it lacks the two-way command and control feature of the present NAWAS. However, with DIDS and suitable home/factory/business office, etc., receivers, the capability for warning extends, reliably, right to the final destination point, rather than only to state and local warning relay points as in the case with NAWAS. DIDS is a direct system to the end user of the information and it provides a means to broadcast or to selectively direct by code addressing, teletype, and/or voice messages to all levels of government, emergency operations, public installations, and other locations having responsibilities during strategic and tactical emergencies. By other codes it can selectively turn on sirens and other warning devices.

4.2.6.1 DIDS Hardware/Facilities

The DIDS concept includes net control console facilities at the NWC and the ANWC. From these control points redundant landline and microwave connect to two high-power VLF radio control transmitters. These control transmitters, backed up by landlines from the control points, key and modulate 10 special distribution LF stations of lower power to provide a rapid and reliable means of transmitting attack warning and other emergency information to specified Federal, state, and local government organizations and facilities; to various institutions, and to commercial radio stations for relay to the public and direct to receivers possessed by the public. The DIDS hardware and facilities would be designed with a high degree of protection from both over pressure and EMP. The proposed DIDS distribution transmitting location are shown in Figure 4-6.

The use of the LF band provides more reliable, longer range area coverage via groundwave than does the typical line-of-sight VHF system.

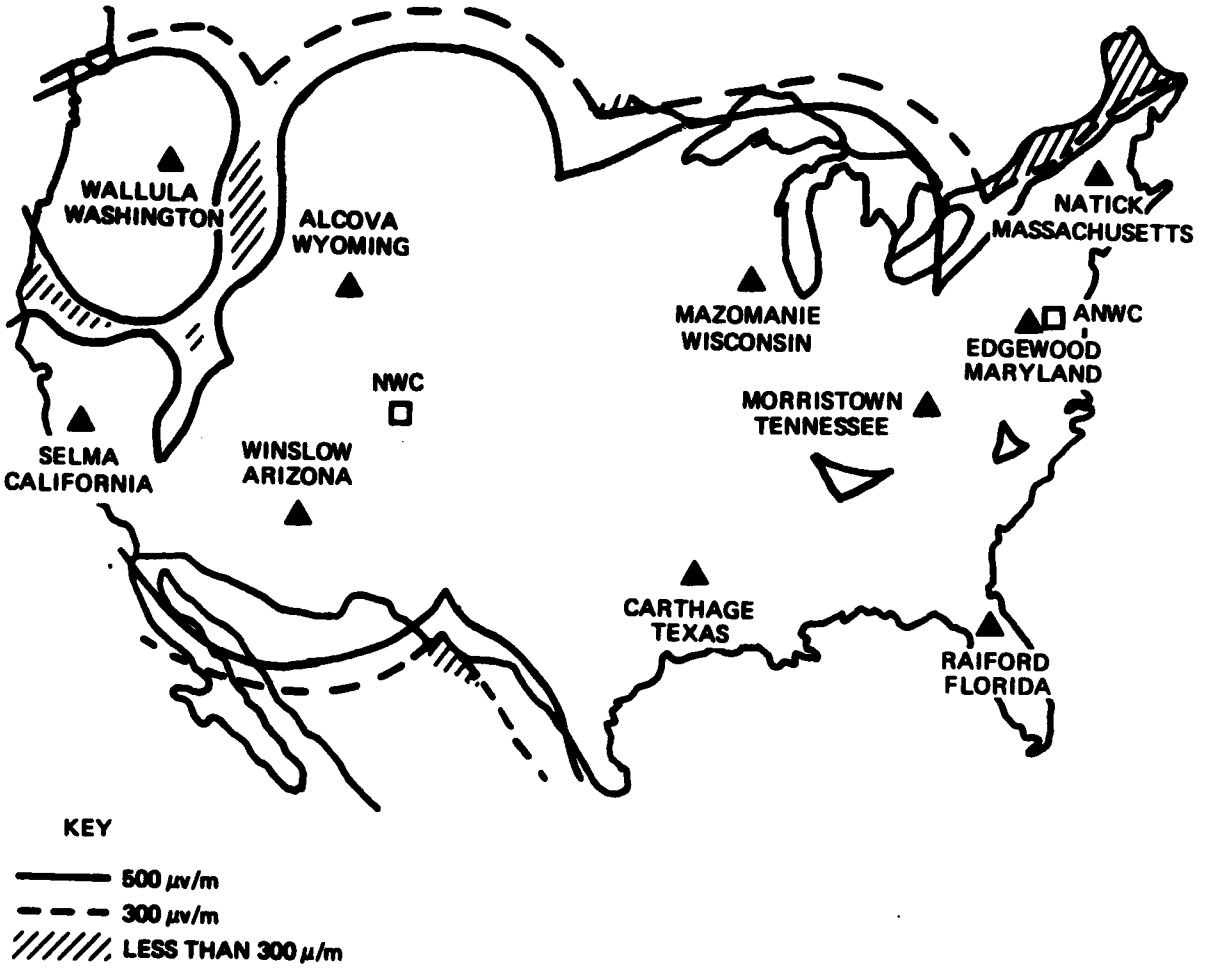


Figure 4-6. DIDS LF Transmitter Locations

The proposed coverage by the 10 facilities would cover nearly the entire area of the country including areas suitable for crisis relocation, thus surpassing the coverage of the NWS radio system.

DIDS provides for a centralized automatic and almost instantaneous activation on a selective basis, by coding, if needed--of local outdoor and indoor alerting systems.

A prototype system with an Edgewood, Maryland, transmitter site, an Olney, Maryland, control center, and sufficient receiving and terminal equipment to test the system was procured and built. The tests were very successful; however, this is as far as the DIDS got due to the previously mentioned national policy stating that the NWS system would be the single Federal government warning system for home receivers.

At present, DIDS is in mothballs; however, the prototype station and control system could be refurnished and placed into operation in an estimated 3 months.

4.2.6.2 DIDS Manning/Procedures

DIDS is a highly automated system concept and does not require the full time attendance of personnel at any of the LF radio stations. All transmission facilities are specified to operate without personnel or other outside resources for a 2-week period. The only inputs required are command and message signals from one of the NWCs. Remote monitoring would allow maintenance and engineering service to the facility to be done by a central maintenance group which need not be dedicated to DIDS alone but can service other government facilities in the area. Control equipment at the NWCs can be serviced the same way and could be operated by existing NWC personnel. Because severe environmental conditions could occur very soon after a warning, DIDS facilities can automatically switch to internal engine-generator equipment in lieu of the normal commercial power source. Each facility is minicomputer controlled.

Primary operating commands originating from the control consoles at the NWCs are implemented by coded transmission to the regional transmit facilities. Various alert messages for broadcast (which can be voice, teleprinter, or both) are carefully composed and prerecorded on tape cassettes which are stored in the control units at the transmit sites. An option also exists for transmitting live voice and teleprinter messages if no prerecorded message is appropriate. Confirmation of messages received from the NWCs and equipment response and status information at the transmit facilities are returned to the NWCs over wirelines by digital signals. Operational and maintenance data and alarms are transmitted from the transmit facilities to remote maintenance centers by teleprinter signals over wirelines. NWC commands contain codes which can selectively operate any or all transmit sites.

Other codes contained in the broadcast message heading can selectively operate receivers at more than 2000 discreet addresses or at all points. Any number of receivers can be used with the system so that devices activated by a DIDS transmission general alert could number in the millions.

An alternate version of a concept for home warning is depicted in Figure 4-7. The national policy is that the acquisition and use of a warning receiver by any citizen for use in his home or automobile shall be a voluntary decision by the individual. Under the concept shown, government procured DIDS LF receivers at selected CATV, TV, AM and FM broadcast stations would receive the warning information by teletype and voice and retransmit it by voice over their regular facilities to standard home or mobile receivers. At the same time, direct voice broadcast of the warning would go to DIDS receiver/switches with solid-state detection circuits which would remain energized while home or car receivers were turned off. Warning signals would activate these circuits to turn the home TV or radio receivers on for direct reception of the warning over the DIDS "front end" and the normal TV or AM/FM receiver audio circuits.

In addition, complete low-cost home receivers could be available to receive warnings direct without recourse to commercial TV and radio facilities. These

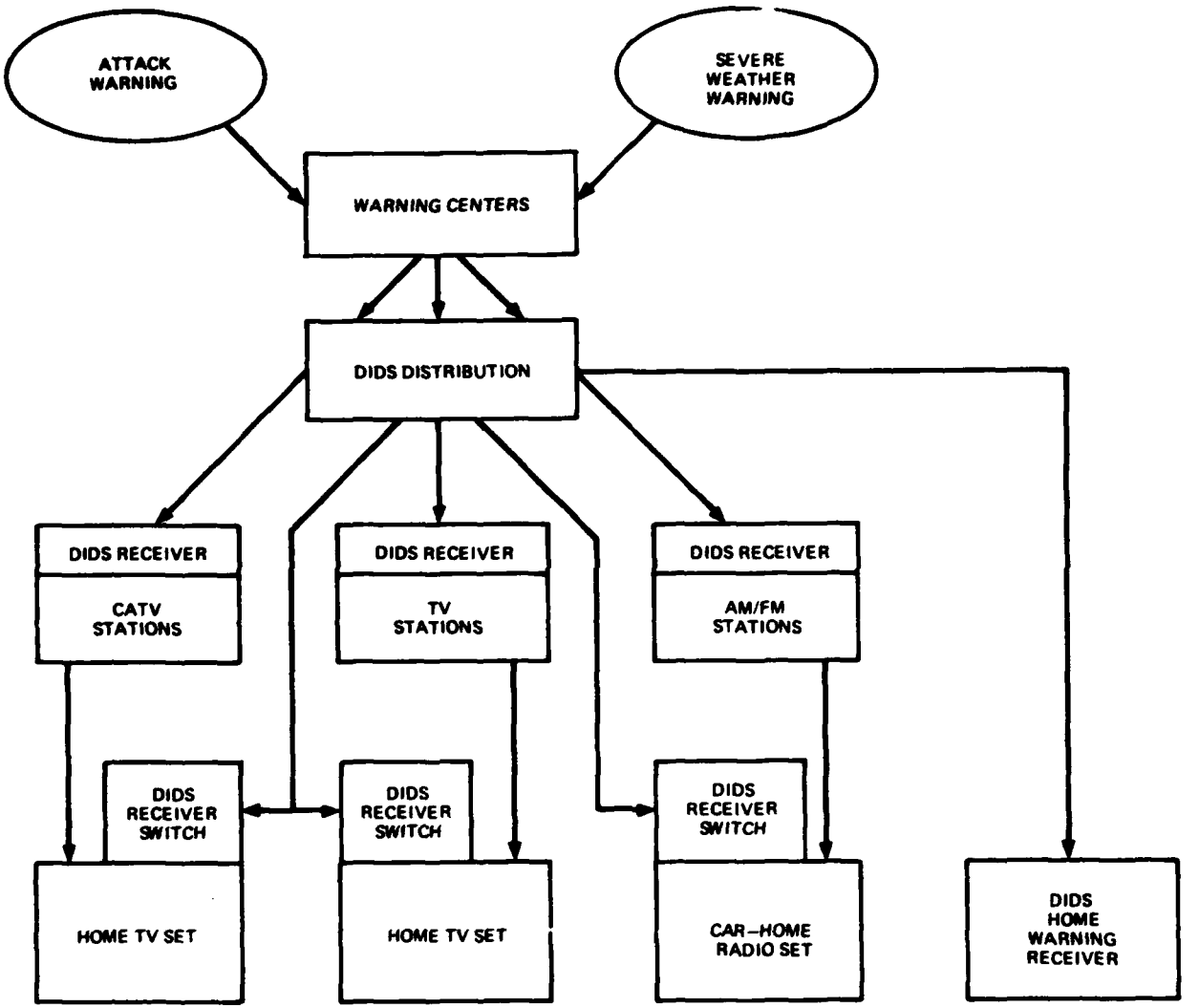


Figure 4-7. Alternative Home Warning Concept

receivers would be for those particularly far out of the way locations where commercial radios and TV are unreliable, CATV is nonexistent and home TV or AM/FM receivers are, therefore, not part of the household inventory.

One aspect of DIDS which is of importance is that it, like the NWS system, is a one-way broadcast type facility. It lacks the two-way command-control communications capability so essential to emergency coordination and disaster recovery operations. In this respect, it is strictly a warning system and must be supplemented by other systems for command and control.

4.2.7 The National Emergency Alarm Receiver System (NEARS)

The National Emergency Alarm Receiver System (NEARS) used the power grid system of the Nation to transmit warning signals to simple devices in homes, offices, and other locations. After a long period of development, the system was declared ready for application. However, NEARS has never been implemented because studies proved that radio systems can provide warning at considerably lower cost. In addition, the radio system can provide voice authentication of an alert signal, which NEARS could not do. The basic concept was tested in Michigan and proved technically successful.

Silicon-Controlled Rectifiers (SCR) are used to generate unique frequencies for transmission over the commercial power system when an alert must be given. The frequencies used are in the 210 to 270 hertz range, slightly lower or higher than the fourth harmonic (240 Hz) of the power line frequency. A small and simple receiver could plug into any AC outlet in homes to be activated whenever the unique alert frequency appeared on the power system.

For a country-wide alert a means would be required to initiate NEARS signaling. One possibility considered was the use of the then National Bureau of Standards (NBS) LF/VLF facilities at Ft. Collins, Colorado, as the base upon which to build the triggering system. Items not completely resolved were the type of modulation required and the alert codes (general and localized) to be used, prevention of false alarms, automatic failure detection, emergency triggering as a last ditch action in

the event of a failure of the normal mode at the time of an alert, and monitoring capability.

4.3 EVALUATION OF FUTURE SYSTEM CONCEPTS

There are a limited number of backbone warning system concepts which may be classified as either improvements or modifications which might enhance the effectiveness of existing or past systems. In addition, there are new warning system concepts, particularly, computer-based communications switching and data transmission configurations which deserve consideration as potential contributors to the warning process.

4.3.1 Improvements to Existing and Past Systems

Almost without exception there are ways to improve the speed, accuracy, creditability, survivability, and other measures of effectiveness of getting out either a regional or general warning, by modifying the hardware and/or procedures which make up the architecture of existing systems such as NAWAS, DIDS, NWS, and EBS. Some of these have been considered previously; some have not.

4.3.1.1 NAWAS

AT&T has suggested a modified circuit configuration for NAWAS. At the present time, Regions 1, 3, and 4 have no direct link to the NWC but must go via another region. Similarly, Regions 5, 7, and 8 have no direct link to the ANWC. To improve network conferencing and give each NWC complete control, AT&T suggests separate lines to each regional circuit from each national warning center and the elimination of adjacent region interconnecting circuits. This proposal, according to AT&T, has the following advantages:

1. Better conferencing - multiple conferencing would be possible, up to four separate conferences

2. **Independent Control by the NWCs** - The present system requires the NWC and ANWC to go via another region to get to some regions (as described above). The proposal will reduce the number of links in tandem and improve transmission characteristics of the network.

In another problem area, the AT&T states they have officially advised DCPA that any additional drops beyond those now connected (over 2300) will require a reanalysis of the network, and possible reengineering and reconfiguration to maintain acceptable transmission characteristics.

4.3.1.2 A Survivable Version of the DIDS

The DIDS, as discussed in Paragraph 4.2.6, was conceived, tested, and planned for implementation as a backbone warning system. However, implementation beyond the prototype facilities has not occurred.

A reason that DIDS was not implemented was the question of its survivability. It had apparently been felt that the DIDS stations could be eliminated in short order by 10 t0 12 well directed missiles rendering them incapable of anything after an initial warning. The high cost of implementing the system was, therefore not justified.

It appears that while DIDS can be hardened for electromagnetic pulse (EMP), its limited number of fixed transmitting facilities are vulnerable to destruction by direct blast effects of present-day accurate missile systems. Therefore, if it is to be used, it must be made less vulnerable to destruction by nuclear attack.

4.3.1.2.1 A Mobile Low Frequency Warning System

It had been suggested that combining the essential elements of the Broadcast Station Protection Program and the DIDS with a mobile capability would provide a survivable, low frequency warning system. This concept is based upon the following considerations:

1. Survivability through mobility and proliferation is a proven concept

2. Reception by the low frequency receivers would not be significantly affected by changing the transmitter location anywhere within an area 50 miles in diameter

3. Two transmitters operating at different frequencies with appropriate spacing and power levels can simultaneously use the same transmitting antenna

4. There are over 4500 commercial AM broadcast stations operating in the United States

5. Low frequency ground wave propagation is not significantly affected by nuclear effects.

The DIDS prototype low frequency transmitting station at Edgewood, Md., proved the reliability of low frequency voice communication as a warning method. The only technical or operational deficiency identified was that the 10 LF transmitter facilities would be easily targeted by an enemy. Mobile transmitters operating among several widely spaced special antennas would mitigate this deficiency. However, this causes other problems, i.e., reduced transmission range, fallout protection for personnel, emergency power, land acquisition, air navigation hazard permits, environmental impact studies, and cost.

Civil Defense Program D Prime provides for the protection of 2000 broadcast stations. If the fallout protected studio and emergency power features of selected stations were increased and if diplexers were installed in their transmitting antennas system to allow mobile transmitters to operate on them, a survivable low frequency radio broadcast capability with complete CONUS coverage could be realized within the present state-of-the art. Alternatively separate LF antennas could be mounted on the commercial broadcasting station tower.

Broadcast stations would be selected for:

1. Location outside a risk area
2. Location relative to other stations

3. Area coverage
4. Height of transmitting antenna
5. Attitude of station management.

An operating unit would consist of several broadcast station antennas located within an area approximately 50 miles in diameter and two mobile transmitter vans about the size of a large recreation vehicle. One of the transmitters would always be at an operating location while the second was enroute to or on station at another antenna ready to operate. In a crisis situation the rate of random operation among the antennas would be increased to maximize survivability.

Since the antennas used are not of optimum height for efficient radiation at low frequencies, more clusters than the 10 planned for DIDS would be required for CONUS coverage. Trade-offs among power, coverage, cochannel interference, and number of clusters must be studied.

Network control from the NWCs might be accomplished by various means including using meteor burst communication as the main transmission media, or as a survivable back-up for a terrestrial telephone network.

4.3.1.2.2 Meteor Burst Communication System (MBCS)

The feasibility of reliable communications by VHF propagation via ionized meteor trails in the atmosphere has been demonstrated. Prototype systems have been designed and a number of links tested. Some of this work has been sponsored by the U.S. Air Force and other work has been conducted in Canada. The directivity of scatter from meteor trails mitigates against the use of this mode for the simultaneous broadcasting of information to many receiving points. The signal does not arrive at a receiver over an expected great circle path, between transmitter and a receiving location. Tests showed that to achieve maximum utilization of this mode of propagation, antennas should be used which simultaneously looked in two directions on either side of the great circle directivity. In addition, information must be sent

only when an indication is received that the path between transmitter and receiver is available and it must be repeated until all receivers acknowledge receipt.

4.3.1.2.2.1 Technical Characteristics of MBCS

An MBCS operates in a frequency band from 35 to 150 MHz and has a maximum range of almost 1200 miles (1930 Km). Propagation is by reflection from ionized meteor trails produced, at a height of 80 to 120 Km, by meteors impinging upon the atmosphere as illustrated in Figure 4-8. About 10^{20} metoors are swept up by the earth each day of which almost 10^{12} have a mass large enough to produce an effective ionized trail. Typically, several hundred times per hour meteor trails are positioned and aligned properly to allow specular reflection of a VHF signal. The reflections may last up to several seconds.

In operation, a master station continuously transmits a probing signal. When a slave station receives this signal, it immediately notifies the master station by using the same reflecting meteor trail. Each station can then send and receive traffic alternately or simultaneously at data rates of several thousand bits per second per channel during the life of the ionized trail. Many frequency channels can be operated simultaneously and high average communication rates can be achieved.

4.3.1.2.2.2 Subsystem Description

A typical MBCS uses directive antennas to illuminate or receive reflections from the common volume of meteor trails existing between the ends of a link. Typically, transmitter powers of approximately a kilowatt have been used. The limiting threshold of a well-designed system is usually cosmic noise. The number of meteor trail reflections observed on a link is a function of the system threshold or signal-to-noise ratio and increases by a factor of three for a 10 dB increase in system sensitivity.

The number of meteor reflections has a seasonal as well as a diurnal variation. The seasonal variation is maximum in July/August due to the fact that the earth's orbit takes it through a more dense region of solar orbiting meteors at

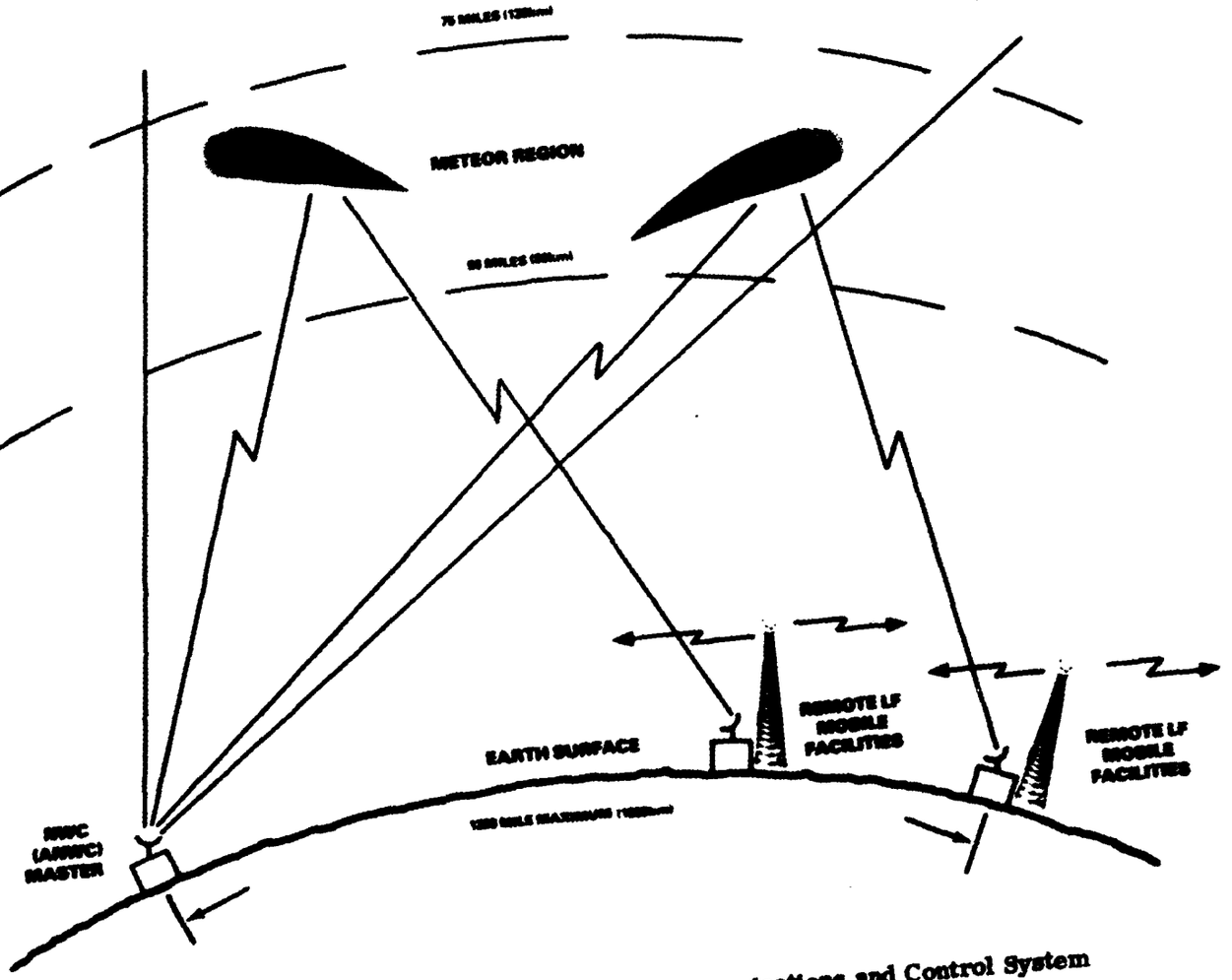


Figure 4-8. Proposed DCPA Meteor Burst Communications and Control System

that season. The diurnal variation is at a maximum around sunrise local time, when the common volume on the propagation path is on the forward side of the earth in its orbital path, and a minimum near sunset when the opposite occurs. The characteristics of reflections are also a function of the radio frequency used; the lower the frequency, the greater the amplitude and duration of the reflected signal.

For a system using an array of 10 dB gain yagi antennas, 1 kW of rf power, -161 dBm/Hz (as limited by cosmic noise) receiver sensitivity, a path length of 1000 miles (1609 Km), and a frequency near 40 MHz, the number of meteor reflections ranges from a minimum of about 50 per hour for the seasonal and diurnal minimum to over 500 per hour for the morning during the seasonal maxima of July/August. The duration of the reflected signal above this system threshold is approximately exponentially distributed, with about half of them being greater than 200 milliseconds. These characteristics of the propagated signal lead to a system where a form of Automatic Repeat Request (ARQ) is implemented. The operation of a system employing ARQ is as follows. The master station continuously transmits synchronization bits, a synchronization character, an address, and characters to describe where, within the data, the message will begin. When the meteor trail occurs the slave station receives the signal, it acknowledges receipt by sending the appropriate response on a frequency several MHz removed from the master frequency. This response is received at the master station via reflection from the same meteor trail. Upon receipt of this acknowledgment, the master station begins transmitting its message. This whole ARQ process will require on the average about 50 milliseconds before the message transmission begins (for a 2000 bps data rate). The remaining duration of the meteor reflection allows propagation of the message content. If the meteor trail disappears before the message is completed, the slave station, using the next meteor trail, advises the master station of the last error free character it received. The master station then resumes message transmission with the next character. Character parity check may be used to detect errors.

The system described above is predicted to deliver a 50-character message with probability 0.95 at 960 km range in a benign environment with waiting times

between useable meteor burst trails as indicated in Figure 4-9. This prediction is consistent with past MBCS operations. The waiting time (the elapsed time between initiation and reception of a message) can be reduced by a factor of two by separating two stations on one end of the link by 50 to 100 miles to achieve spatial diversity. Each of these stations uses separate meteor trails to establish a link with the distant station.

4.3.1.2.2.3 Link Integrity

An MBCS link has the potential of surviving nuclear ionsphere effects because of the ability of the system to look around highly absorbing regions. The system is generally immune to an ECM threat from signal sources beyond line-of-sight of the receiving terminal except possibly in cases where Sporadic-E ionization supports propagation of the interfering signal from a long distance.

4.3.1.2.3 Applicability of MBCS to Mobile LF System Control (Survivable DIDS)

VHF MBCS control transmitters located at carefully selected locations with antennas beamed in the general direction of the mobile LF broadcast areas mentioned above, would transmit probing signals prior to sending the warning information messages. These highspeed message bursts would be transmitted upon the receipt of a signal from any remote station, signifying that propagation by the meteor trail mode is possible at that moment between the two points involved. Each remote terminal transmitter in the DIDS broadcast area will be assigned a different transmit frequency, but all will receive the same frequency from the control transmitter. Thus, the control station will know which remote terminals have received the warning message and the control will continue to sound or probe for propagation paths to other remote terminals and repeat the warning message until all are accounted for. As an added feature, the system can be programmed to have a unique signature for each remote terminal and to repeat back the warning message or an acknowledge (ACK) to the control terminal as confirmation of receipt, upon command from control on the next available propagation path. Detailed analysis of this kind of a system configuration and protocol would have to be performed to determine the optimum mix, design, and configuration of control and remote facilities to meet the warning time requirements.

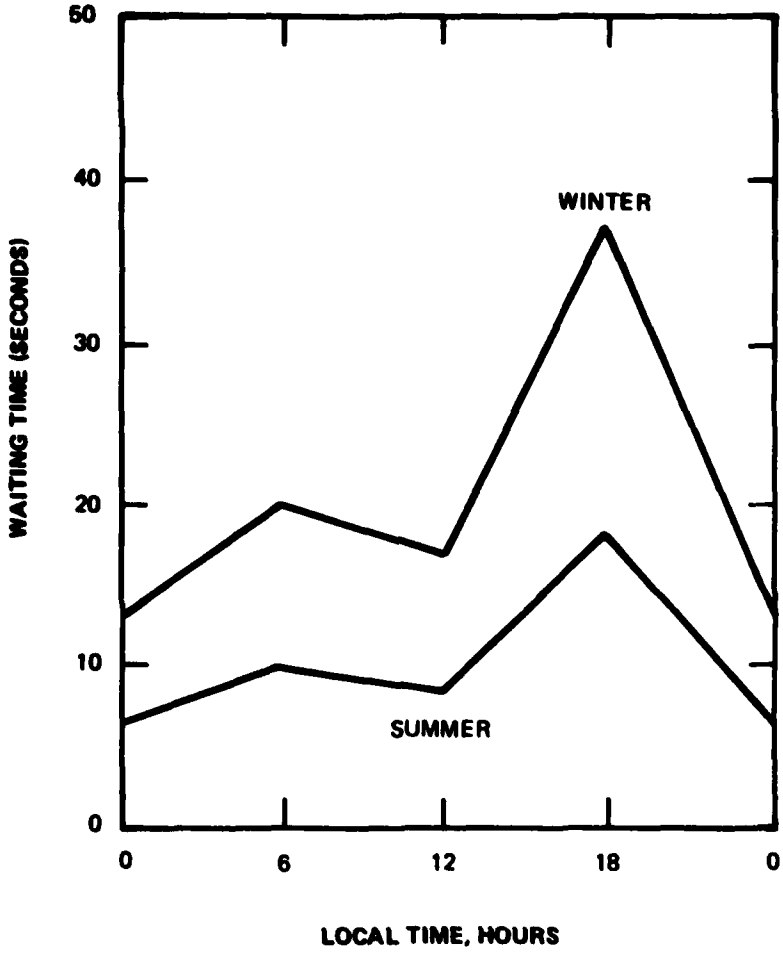


Figure 4-9. Typical Waiting Time Between Useable Meteor Burst Trails

4.3.1.3 Telephone Warning (Group Alerting Systems)

Past studies and concepts in the area of telephone alerting and warning have relied upon a voice message which is the very aspect of the design which would overload and block the telephone system.

In order to cover busy circuits at the time of an alert the telephone system would have to have technical modifications made to seize and override the calls in progress and transmit a unique audible alert tone over these circuits in coordination with the device alert signal.

It is conceivable for the future, that devices and systems might be developed to successively alert groups of subscribers through individual exchanges so that all connected and idle subscriber sets could receive an alert signal over a period of 2 minutes. A device similar to a smoke alarm could be set off by the unique alert signal, the same as telephone ringing current activates the subscriber ringing circuits. However, in this case, ringing current would not continue because another group of subscriber circuits would have to be pulsed with the unique alert signal every few seconds in order to cover all subscribers in less than 2 minutes. Upon receipt of the alert signal, the warning device would be activated and the warning signal would continue, powered by local batteries or commercial power until turned off.

Many variations of this concept are possible and should be studied in detail. As an example, one variation would actually use home and office smoke detectors to give the warning. It would be necessary to add a pair of wires bridging the telephone circuit to a transducer added to the smoke detector. When activated by unique telephone pulsing currents the transducer would by mechanical means cause the alarm to emit its signal in a unique series of pulses which would signify that a telephone circuit warning has been given rather than a smoke or fire warning.

4.3.1.4 An Improved NWS System

The present NWS radio warning system is oriented toward large concentrations of the population, which after crisis relocation, might be dispersed to the point where the existing system would be ineffectual for reliable warning or disaster recovery functions. The present NWS is also manual to a large degree which causes excessive time to be consumed in the preparation and processing of information. Two possible solutions to these deficiencies, respectively, are the use of a satellite, with its wide area coverage, and automation of some of the manual processes causing undue delay.

4.3.1.4.1 Satellite vs. Terrestrial

In 1974 a study was conducted for NASA by CSC entitled, Disaster Warning System (DWS): Satellite Feasibility and Comparison with Terrestrial Systems. The purpose of considering the DWS was to provide the NWS with communications services in the 1980s and to develop a technical and cost comparison between satellite and terrestrial systems to accomplish the same or similar disaster warning missions. The analysis resulted in conclusions that both the satellite and terrestrial baseline systems would satisfy the NOAA DWS requirements but at high cost. Since the DWS is sized to handle peak traffic loads, the communication capacity utilization is low (about 15 percent). Consequently, the available capacity could be shared with other agencies as long as the DWS function is given priority. A satellite DWS, therefore, shared by NWS and DCPA, merits consideration as a backbone warning system, particularly since much progress has been made in the satellite area and satellite costs have decreased. Refer to Paragraph 4.3.2.3 for further consideration of Satellite Warning Systems.

4.3.1.4.2 Automation of Field Operations and Services (AFOS)

A plan is being implemented for providing automated facilities at NWS field offices which will have a positive impact on traffic flow thus reducing warning time.

The NWS is required to provide an ever-increasing population of users, in terms of both numbers and kinds of service required, with the highest quality products that the scientific state-of-the-art will permit without extensive expansion of the field staffing structure. Through automation, these products can be produced and moved through the system to the end users in a fraction of the time that it presently takes, professional personnel can be relieved of routine sub-professional tasks, and the system can respond to emergency situations in a much enhanced manner.

The products referenced are reports and warning data developed at the National Meteorological Center (NMC) in Suitland, Maryland, input data, received in many formats, from the Weather Service Forecast Offices (WSFOs), Weather Service Offices (WSOs), Weather Service Meteorological Observatories (WSMOs), River Forecast Centers (RFCs), River District Offices (RDOs), the National Hurricane Center (NHC) in Miami, Florida, and the National Severe Storms Forecast Center (NSSFC) in Kansas City, Missouri.

The present traffic flow is represented by Figure 4-10, and as can be seen there are many links and interfaces.

Under the automation program, all of these centers and offices would appear as terminals on a National Digital Circuit, formulating data for computer processing and subsequent prompt release through warning facilities to the mass media and the public. Figure 4-11 is representative of how a disaster warning system could be implemented with AFOS.

4.3.1.5 Crisis Home Alerting Technique (CHAT)

This concept was developed to serve as an interim means of using existing radio and TV stations for nighttime warning without the need for special receiver attachments.

Under this concept and during a crisis situation, it would be possible for individuals to leave a receiver turned on with low audio volume and tuned to a station, as instructed by the authorities. The broadcast station would be operating with either

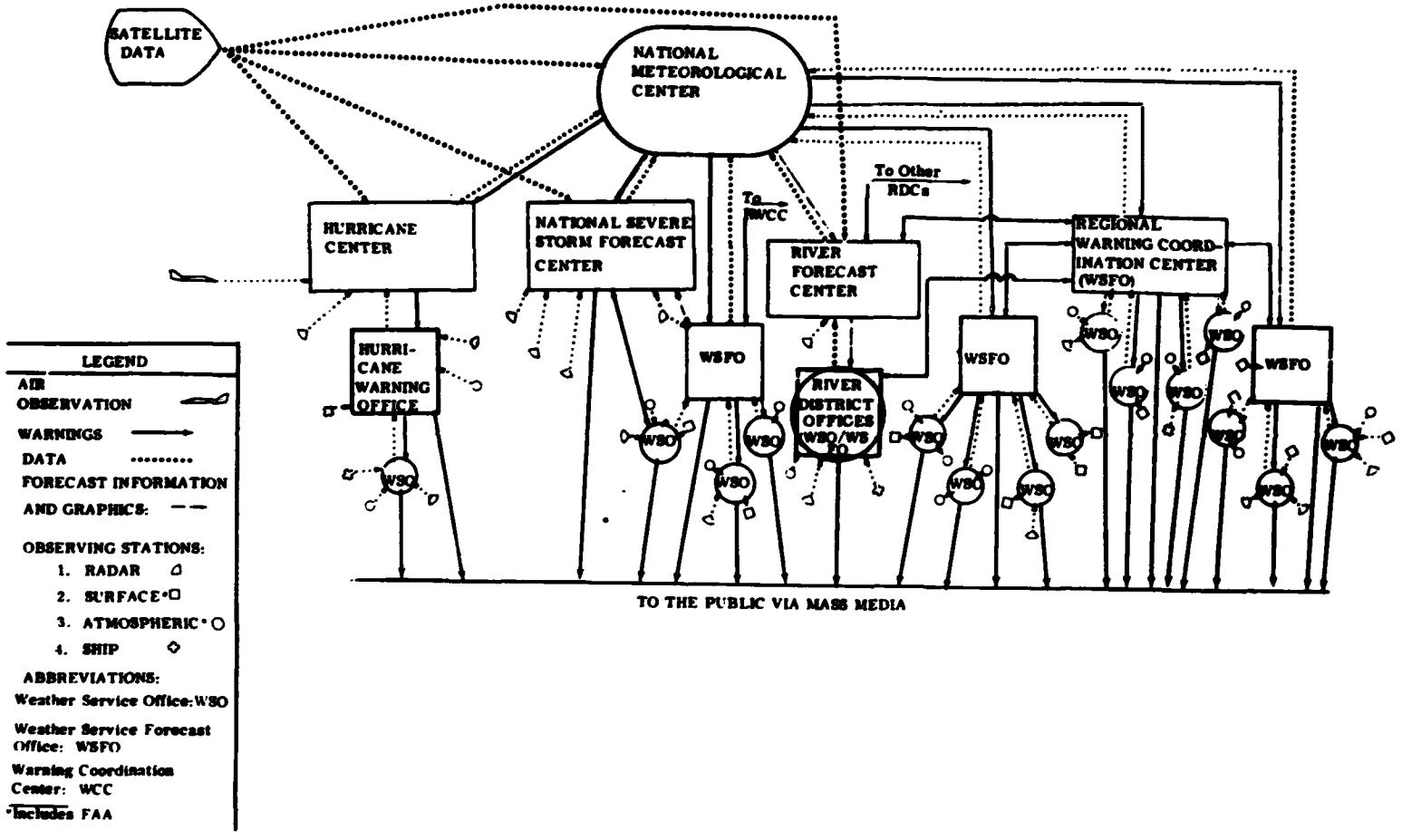


Figure 4-10. Representative NWS Traffic Flow

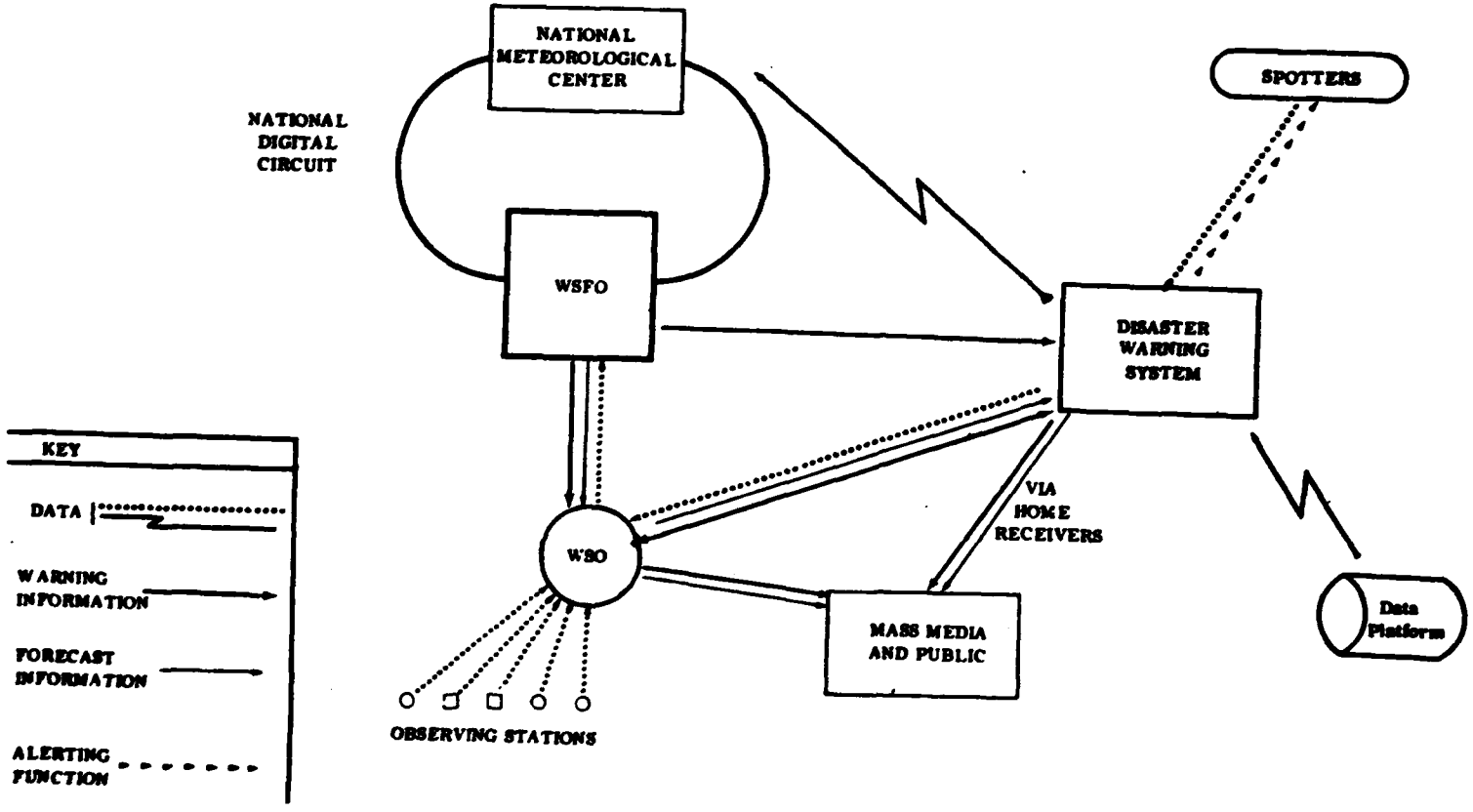


Figure 4-11. Implementation of a Disaster Warning System

a low modulation level or no modulation at all. If an attack warning should be required during this nighttime period, the broadcaster would apply a maximum modulation signal to awake the sleepers and then provide a warning broadcast.

There are variations to the above scenario with VHF TV receivers being preferred because a channel can be accurately tuned for monitoring without any audible signal. An economic factor, however, inhibits the implementation of this warning method due to the cost of maintaining broadcast facilities in the "ready" mode.

The system has additional problem areas including:

1. It is not well suited for situations without a crisis buildup as people would not normally adjust sets before going to bed
2. System is wasteful of energy due to keeping broadcast stations and millions of radios and TV sets on for extended periods
3. Most people would want to adjust their sets before the station signed off from normal broadcasting and would not want the set on when the station began its broadcasting day.

4.3.2 New Warning System Concepts

Among the most important criteria for a successful warning message are speed and accuracy. Both can be achieved by the use of high-speed data transmission using computer control for electronic, rather than manual, interfaces at all intermediate system points. It is, therefore, useful to evaluate existing systems which might be adopted, modified, or upgraded to give national warning capability in addition to their primary functions. One class of systems which may be considered for this mission are the Nation's law enforcement and criminal information networks. These include the NLETS and state law enforcement networks such as the Colorado Crime Information Center (CCIC).

4.3.2.1 NLETS

NLETS is a computerized, high-speed message switching system created for and dedicated to the criminal justice community. Its sole purpose at present is to provide for the interstate and/or interagency exchange of criminal justice and criminal justice related information. NLETS contracts with the State of Arizona to provide facilities and house the operating system 24 hours a day in a secure law enforcement environment.

4.3.2.1.1 NLETS Hardware/Facilities

NLETS began as a teleprinter system using manual torn tape relay methods. In May 1973, a system upgrade program was inaugurated that provided for an increased number of dedicated communications lines used in the system. In addition, the system line speed was increased to 150 words per minute (using Teletype Model No. 37 ASRs). Also, 2400 baud lines were provided for the direct connection of the NLETS central computer to computers in the various states.

In July 1975, NLETS completed installation of multiplexers at key geographical locations which allow splitting and sharing of voice grade circuits. Effectively, however, all states still have a dedicated channel to the NLETS computer.

NLETS is supported by a duplexed computer system located at the Arizona Department of Public Safety in Phoenix, Arizona. Figure 4-12 shows the general system configuration with the concentrators at Trenton, New Jersey; Atlanta, Georgia; and Springfield, Illinois; multiplexers at Cheyenne, Wyoming and Boise, Idaho. Direct lines are provided to the other states except for Alaska, which is interfaced through the National Criminal Information Center (NCIC) network and Hawaii, which is not part of NLETS. Figure 4-13 shows the hardware configuration for the concentrator part of the network, and the Phoenix computer.

A command terminal is associated with the NLETS message switching computers housed within the Arizona Department of Public Safety Communications complex.

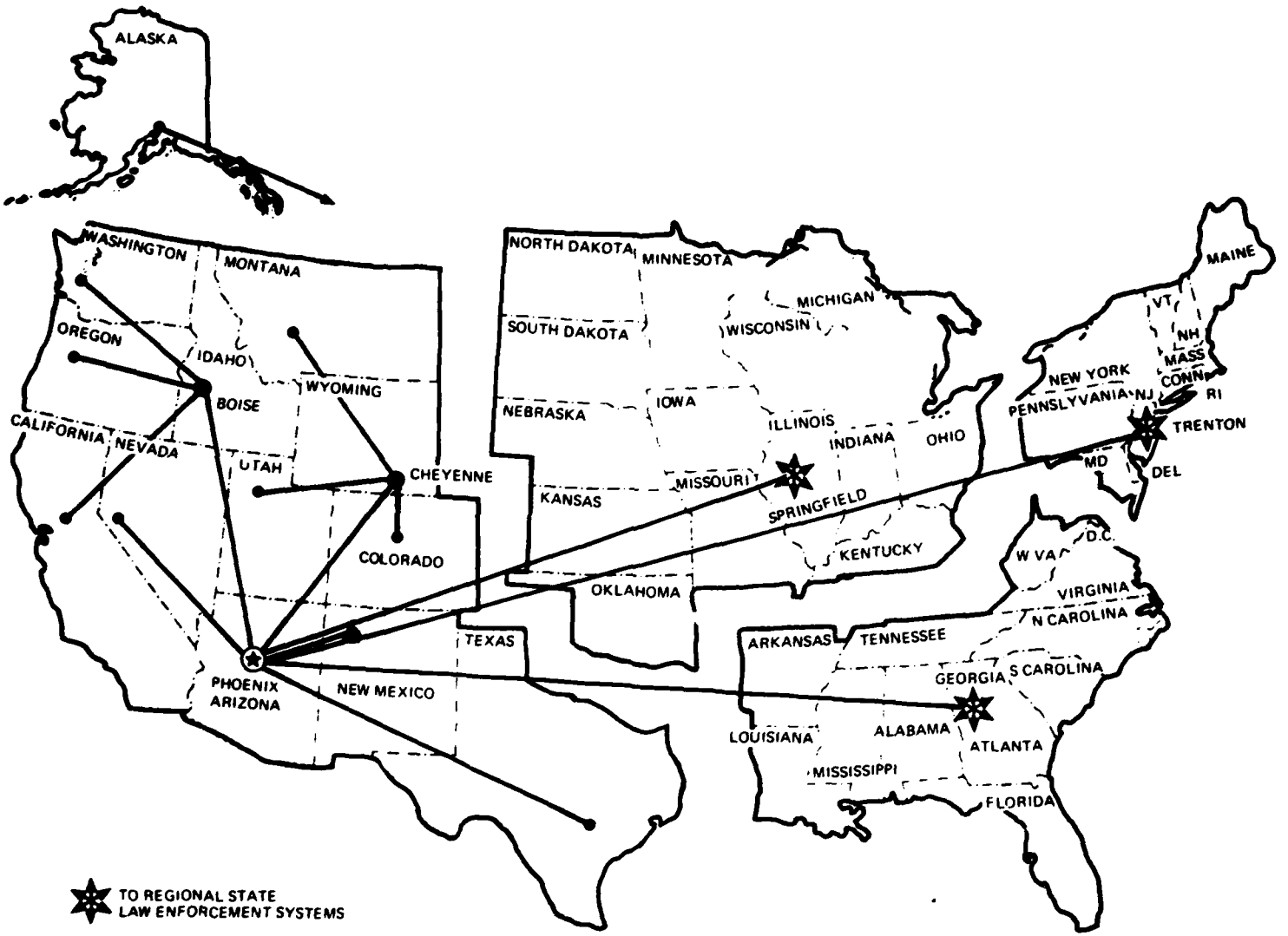


Figure 4-12. NLETS Concentrator/Multiplexer Network

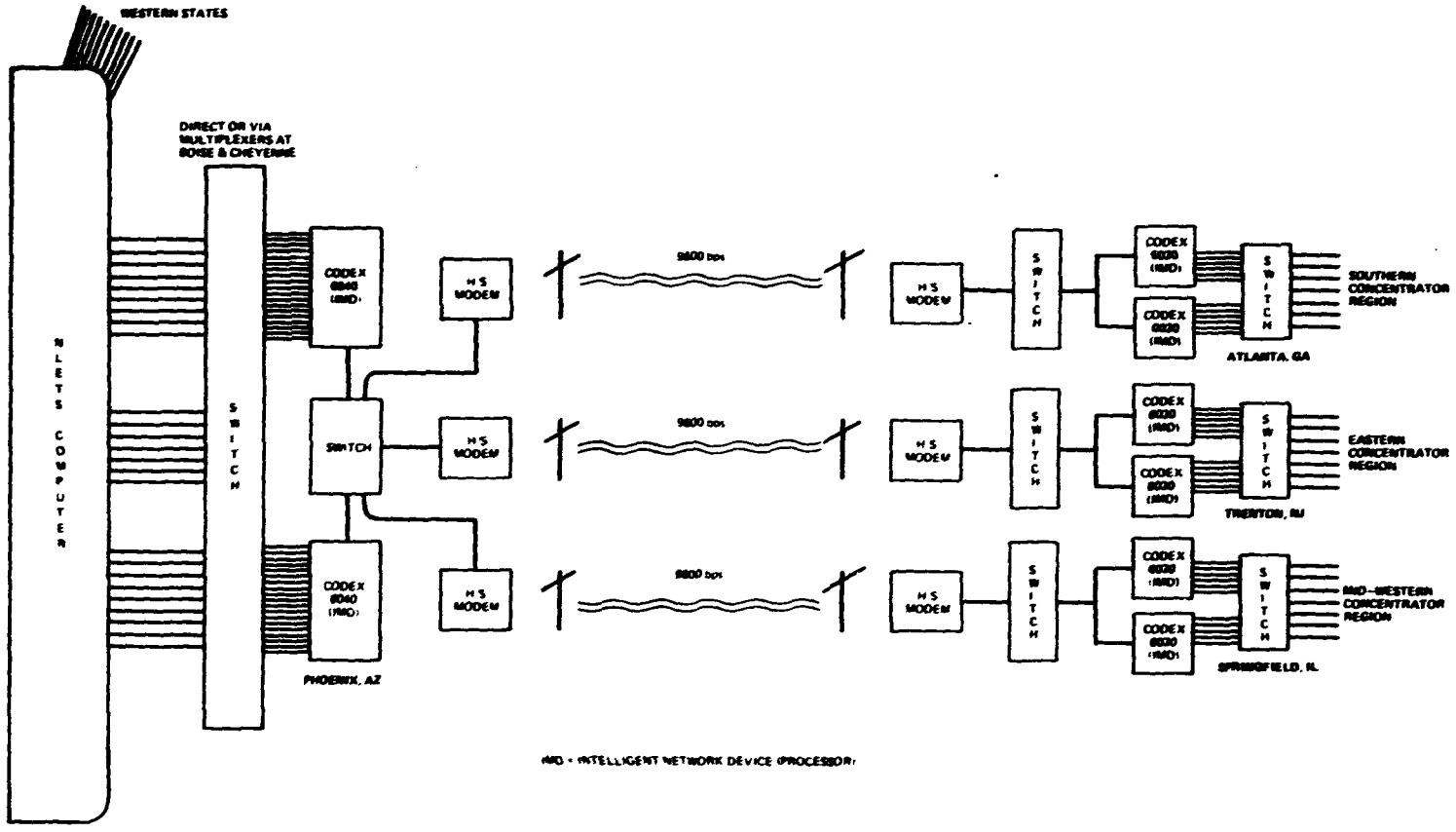


Figure 4–13. NLETS Concentrator Network Block Diagram

Each state has a system point of entry which is the location where the NLETS line actually terminates. In states that have an NLETS computer, this is the state computer system. In states that do not have an NLETS computer, an ASR 37 terminal serves as the point of entry.

4.3.2.1.2 NLETS Manning and Procedures

The NLETS organization is made up of representatives of law enforcement agencies from each of the 48 Continental United States, the District of Columbia, and Alaska and several Federal law enforcement agencies. NLETS is incorporated under the laws of the State of Delaware and is a non-profit organization whose purpose is to provide for an improved interstate law enforcement and criminal justice communications system.

Organizationally, NLETS is comprised of eight regions. Each region represents three to eight states that are grouped together in a manner that represents a regional community of interest (see Figure 4-14). These regions are not synonymous with NAWAS regions.

The system has the capability to receive, store, and forward message traffic from and to all its user agencies. Administrative message traffic on the system includes all types of free form criminal justice related data that may be sent from one point to one or more points. In addition, NLETS supports inquiry into state motor vehicle and driver's license data bases. Planned expansion may include support of other data bases, such as disaster warning.

Each state or Federal agency that is an NLETS associate, must designate a criminal justice agency as the control terminal agency. This designated agency is responsible for maintaining operational surveillance over the state line and for providing dissemination services in and out of the NLETS network.

For manual terminal states, inquiries and administrative messages are directed to the control terminal for further action. In automated states, traffic will be directed automatically to the destination on the state network. In all cases,

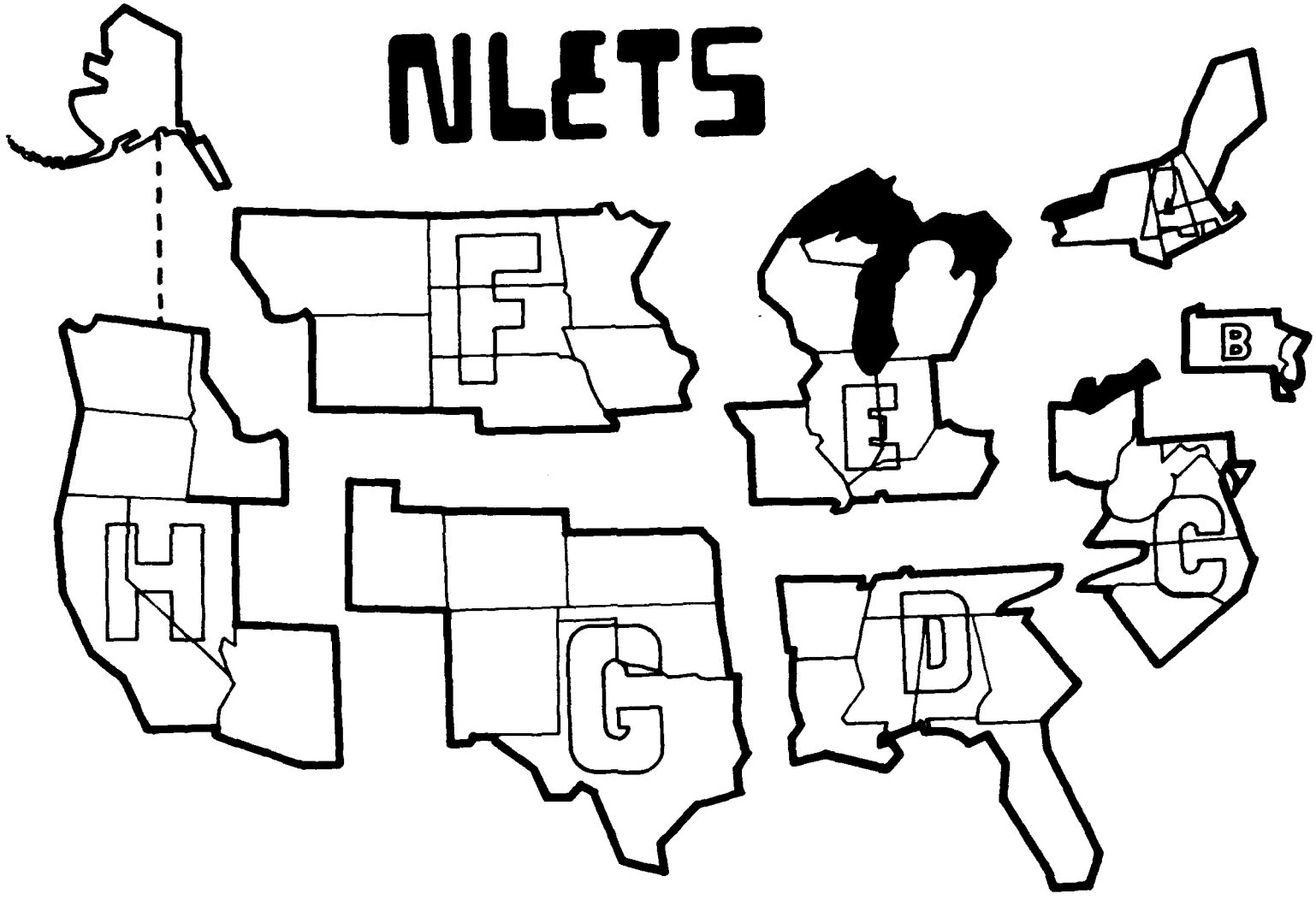


Figure 4-14. NLETS Regional Organizational Structure

the state control terminal agency is responsible for the expeditious delivery of messages to the designated destination. Provisions are made for statewide, regional, and all points message broadcasts, as appropriate and as requested by the originator.

Because of the many 37 ASRs initially on-line, the NLETS system resembles a 37 ASR network. However, as the transition from low-speed to high-speed lines continues, emphasis on 37 ASRs and their requirements will be phased out in lieu of a network designed specifically for high-speed transmissions.

NLETS receives, stores, and forwards messages. If an intended receiving terminal is prepared to receive, messages are sent immediately. If the receiving terminal or system is inoperable, the sending terminal is notified and NLETS will periodically attempt to transmit the message.

4.3.2.2 Colorado Crime Information Center (CCIC)

One of the state systems with which NLETS has a direct high-speed computer-to-computer interface is the CCIC telecommunications and information system. The following information, in part contributed by the Department of Local Affairs, Colorado Bureau of Investigation, shows how existing law enforcement telecommunications resources may be used to relay vital information during disaster or other emergency alert situations. For this purpose, we shall concentrate on the CCIC and its interface to NLETS.

4.3.2.2.1 CCIC Hardware/Facilities

The CCIC telecommunications and information system is a statewide network, attended at all times, and providing rapid, hard copy message type communications to any combination of or all points simultaneously. These terminals are usually located in active emergency communications centers such as police stations, sheriffs' offices, and highway patrol posts. The central computer and more than 75 of the planned 150 terminals are already installed and operational. The transmission is over 2400 bps circuits leased from the telephone company. If a disaster warning mission were added to the job of this system, additional terminals could be installed

in other locations such as key defense locations, firehouses, and disaster control centers, as required. The basic computer programming for the system is done and already in use. The present computer site is not secure but secure space could be made available. There is no uninterruptible power or backup power and this would have to be provided.

4.3.2.2.2 CCIC Manning and Procedures

A large pool of skilled operators and maintenance personnel exists, who routinely utilize and support this system. They are provided by the user agencies throughout the state. Several of these user agencies have expressed a need for a central repository of disaster supply inventory information. Predrafted messages and records would be stored and forwarded as required by the system. An operator would simply address a message to a prearranged destination code (e.g., "To Colorado") and all that is typed thereafter is transmitted within seconds, in hard copy form, to every county in the state. During the past year the system relayed over 600,000 such messages relating to law enforcement and public safety operations.

The following example depicts how a national alert could be disseminated by the NWC or ANWC sending an alert/warning via the NLETS computer in Phoenix, Az., and the CCIC computer near Denver, Co.

1. The NWC (or ANWC) transmits a warning message over an NLETS terminal routed to all system points
2. The NLETS computer automatically routes the message to all participating states within 30 seconds, with no human intervention. If the line to the state (Colorado) computer center is out of service, the national switching center (NLETS) queues the message and automatically transmits the message as soon as the state system is available
3. When Colorado (CCIC) receives the message it is automatically (no human intervention) routed to all state system terminals and printed within 1 minute

4. Less than 90 seconds have passed (if all systems are functioning) between the release of the message by the NWC (or ANWC) and the receipt of the hard copy message by all state/local NLETS-supported agencies in Colorado.

Note that the transmission rate over both the NLETS and the CCIC systems is 2400 bps. Most states have computer controlled systems, but operate their terminal lines at lower speeds. Thus, the message, if it were a standard warning message, would take up to another 30 seconds at the lower data rates to reach its destination due to the increased code transmission time, but could be at all terminals in less than a total elapsed time of 2 minutes.

4.3.2.3 Satellite Warning Systems

The proliferation of satellite relayed communications over the past 15 years has been one of the great developments in the transmission of information. The technology has experienced a rapid development throughout the 1960s and 1970s and it is predicted that the 1980s will test the feasibility of practical applications in the public service field. Surely, warning the public of an impending crisis or disaster and coordinating emergency action to minimize the effects and recover are important aspects of public service. Synchronous communications satellites are attractive vehicles for:

1. Broadcasting information from a few to many points
2. Providing many points access to a central data base
3. Routing information in an extremely flexible manner by either acting as a switch or as a control to switch terrestrial systems
4. Providing surveillance either by direct means or by gathering data from ground sensor locations.

4.3.2.3.1 Public Service Satellite

A program is underway to advance U.S. Public Service telecommunications activities using the HERMES satellites. Some of the activities currently being benefited are:

- Education
- Training
- Employment
- Social services
- Health
- Law enforcement/justice
- Veterans benefits/services
- General sciences
- Space technology
- Disaster services.

Public service satellite testing began using the NASA ATS-6 satellite with major experiments being conducted in education by the Federation of Rocky Mountain States and in health services by the Alaska Native Health Service. The latter service is being continued using a satellite of the Alaska Communications Network operated by RCA.

An organization known as the Public Service Satellite Communications Consortium (PSSC) is made up of over 90 non-profit agencies from the fields of education, health care, library service, public broadcasting, state government, and related interests. Its function is to identify categories of telecommunication services which could enhance productivity in those areas, using the assumption that an appropriate network will be available and that there will be high acceptance of the new services in their target markets. For the services to become economically viable, however, commercial as well as public service activities must benefit. In addition, in the absence of Federal leadership, it is unlikely that there will be the required coordination to collectively justify the necessary system development.

The above suggests that a satellite system with the primary mission to provide national and regional warning services to the public could be established with Federal contributing funds with other funding by a community of users. INTELSAT is an example of a satellite system owned and shared by a large community of users.

If a satellite of the HERMES class were dedicated full time to the public services, not only might the funds be available from many sources to help pay the operational expenses, but the system would be maintained in operational condition and thus be available when needed for emergency warning. A system which lies dormant except for periodic testing may not be available when it is most needed.

4.3.2.3.2 Future Public Satellite Systems

NASA has studied advanced satellite communication systems which might use two-way wrist radios as personal SATCOM terminals. These wrist radios might be mass produced to cost approximately $10. While the satellite system envisaged the design, development, and deployment of a very large communications switching satellite in synchronous orbit, the analysis indicates that the technology will be available in the next decade to realize such a system. Since a personal warning radio need only receive, it is far more conceivable that a satellite system could be developed to broadcast a warning message simultaneously to every individual possessing such a small wrist or desk-top receiver. Furthermore, a command/control two-way capability could be available to the emergency coordination centers for relay of crucial follow-up information to the general public, all over the same satellite system.

4.3.2.3.3 DCPA Emergency Satellite Communications System (ESCS)

During the time period of this warning analysis, DCPA went to industry to get a price quotation for the cost of providing a major nationwide emergency satellite communications system capability. The basic requirement included a satellite transponder and 176 earth terminals. The transponder would have the capability of providing 10 voice channels and one half duplex TV channel.

Sixty-two of the terminals would be fixed terminals to be located at key Federal and state emergency communications headquarters. An additional sixty-two would be transportable units that could be carried by truck or helicopter to disaster areas. The last 52 would be small man-portable units to be used for close-in support work such as for initial and continued close-in support of forest fires, floods, airplane wrecks in isolated areas, and similar emergencies.

The objectives of the system included the following capabilities:

1. By means of the man-portable terminals, be able to establish minimum voice/data communications between a disaster area and the fixed state, regional, or national disaster communications control headquarters in less than 1 hour after arrival at a disaster site

2. By means of the transportable earth terminals, be able to establish multiple voice, teletype facsimile, data and television capability between a disaster area and the fixed state, regional, or national disaster communications center in less than 4 hours after arrival at a disaster site

3. Provide for voice/data communications among the multiple portable communications terminals that may be in an emergency/disaster area

4. Provide for a nationwide communications network for coordination among the state, regional, and national disaster control centers located within the 50 states

5. Provide for a nationwide communications network for emergency/disaster preparedness training, coordination, and data and information distribution.

Such a network as envisioned here provides an exceptional opportunity for upgrading the basic warning system to Federal, state, local authorities and by expansion to the general public.

The total area coverage offered by satellite and the broadband capability provides the opportunity to decrease dependence upon less efficient networks and to consolidate emergency related communications into a highly reliable integrated system.

With a back-up satellite transponder capability available, the major potential impact of loss of communications due to the failure of the one common unit could be greatly reduced.

4.4 SYSTEM VULNERABILITY/SURVIVABILITY

A distributed network such as the domestic terrestrial Bell System, with its many routes, links, nodes and interfaces, can experience regional or sectional failure due to the loss of one or more links or nodes. However, the overall network has excellent reliability because its configuration and architecture provide for many alternate, and therefore redundant, paths between any two major terminal points. In simple cases of equipment failure the network can be automatically reconfigured to maintain service and its switching centers are programmed to do just that in a matter of seconds. If failure is due to extensive damage beyond the capability of the network to cope automatically, then, manual rerouting of trunk groups and circuits around the lost sector is used. This may take a number of minutes or hours to accomplish.

This high degree of reliability provided by the Bell System is a valid indicator for overall performance in a peacetime environment. Unfortunately, it does not apply directly to the survivability of a dedicated multipoint network under nuclear attack situations, which is the proper environment for evaluation of NAWAS. Although the Bell System may have the capability to route a call from the East Coast to West Coast by alt-routing even during or immediately following a nuclear attack, that does not imply that NAWAS circuits with their relatively fixed routings and chainlike interdependence would survive or be capable of being reconstituted in the extremely short time periods essential for a nuclear attack warning system.

On the other hand, satellite systems are vulnerable to the loss of the satellite transponder. In practice, experience with geostationary satellites has shown transponders to be extremely reliable. However, if one should fail unexpectedly, the results could be catastrophic. Fortunately, preventive measures such as spare in orbit satellites, or prearranged use of spare transponders on the same or other satellites, can greatly alleviate this problem.

One of the more important criteria for survivability is the capability to restore communications quickly in cases of failure. This capability can be achieved through a redundancy of available communications elements such as:

- Nodes
- Links or paths
- Systems.

Other important criteria for survivability are the degree of physical protection given crucial facilities and, as discussed in Paragraph 4.3.1.2, the degree of mobility of facilities which might be provided.

A major threat is the actual physical damage or destruction of communications facilities by blast effects or natural disaster phenomena.

Another major threat to communications systems survivability is the widespread disruption from the effects of the EMP produced by a high-altitude nuclear event.

4.4.1 Physical Damage

Survivability of communications facilities from blast damage, conventional or nuclear, and under extreme environmental conditions such as earthquakes, floods and severe storms, can be enhanced by designing for the extremes to be encountered. The methods for protection from such threats, such as underground construction, shock mounting of critical equipment, redundant antenna systems housed in a protected area and deployed after the bombing has ceased, mobility and redundancy, are well known. The degree to which radio and other communications installation such as cable repeaters and switching centers are protected by hardening, or by redundancy, is something that has to be assessed from a total system viewpoint and with cost-effectiveness involved. Many trade-offs are possible in this area of system design and implementation.

4.4.2 EMP Effects

A number of EMP tests have been made on operational AUTOVON switches in recent years and the effects analyzed. A transportable EMP (TEMP) simulator in

close proximity to the equipment to be tested has been used to produce field levels similar to those expected from a high-altitude electromagnetic pulse (HEMP) source. These field levels are in the 50 KV/meter range. Although the EMP phenomena is similar in many respects to the effects of lightning, the EMP resulting from a nuclear burst is characterized by a much more rapid rise time (2 to 10 nanoseconds). When caused by an exoatmospheric nuclear burst 250 km or higher, the entire United States may be illuminated by electromagnetic radiation in the 10 KHz to 100 KHz frequency range in a fraction of a second. Due to the fast rise time of the transients which can be induced in communications facilities, normal lightning protection is generally not sufficient to suppress these transients and prevent damage to components or disruption to operations.

Twenty-six of the existing 60 AUTOVON switches are underground, blast hardened to 50 psi; however, this alone will not harden them for EMP. Any metallic conductor penetrating a communications facility is a potential carrier of damaging electrical transients; therefore, special treatment of these sites and others, not blast hardened, is necessary for EMP hardening.

Tests mentioned above were conducted on active AUTOVON switches. Test results on electronic solid state, ESS-1 switches, the AUTOVON mainstay, produced no permanent damage. Although there were numerous interrupts, false activation of alarms and false activation of the administrative control network, the system recovered within 40 milliseconds. Out of thousands of calls initiated during one series of tests at one exchange, eight were not completed. The tests did not uncover any significant vulnerability of the ESS-1 to EMP.

Test conducted on the Automatic Electric Company mechanical switches revealed greater vulnerability to EMP than did the ESS-1. Disruptions noted could put an Automatic Electric Company switch out for from 3 minutes to 3 or 4 hours.

In addition to the switches, other network components can be affected including the microwave systems, the cable systems, rectifiers, power control circuitry, and primary frequency supply. The L-4 carrier system can be shut down if the induced

ground potential exceeds 7 volts/mile. The EMP-MHD (magneto-hydrodynamic) effect can provide this potential. The microwave radio link will not fail but may suffer a degraded signal-to-noise ratio.

4.4.2.1 The Bell System EMP Program

As a positive result of previous testing, the Bell System has a program designed for survivability of the system in a multiple EMP environment. EMP hardness is being taken into account in the design of new facilities using a larger amount of integrated electronics and digital circuits, since these are more susceptible to EMP than discrete solid state devices and analog circuits.

The objective of the Bell System program is to avoid service disrupting failure due to an EMP. The testing and analyses accomplished by Bell Laboratories and others through 1975 indicated the types of component failure that could occur and the results that these failures would have upon the service. By and large, these results would be in the nature of misdirected calls rather than a complete loss of service. It was also determined that EMP would not destroy or alter information in magnetic storage. Study of current data on EMP leads one to the conclusion that there is a good chance that any warning system using Bell System facilities for communication during a nuclear event might exhibit short periods of erratic operation due to EMP, but would not be destroyed or disrupted long term by EMP alone. Dedicated circuits like NAWAS are much less apt to have problems than would be encountered in attempting to dial through switches.

Furthermore, it appears that much progress has been made in the development of EMP hardening techniques, which, if followed in the construction of new systems (telephone, radio, or any other transmission mode) should drastically reduce EMP as a survivability threat.

Due to AT&T's need to be competitive with the specialized common carriers and domestic satellite carriers, Bell may be putting less into protection of this type unless the government (or customer) pays for it, since the specialized common carriers do not provide for hardening or EMP protection.

4.5 BACKBONE SYSTEMS SUMMARY

In evaluating the systems described above, consideration must be given to the actual and potential role they may have in meeting the basic backbone requirement of getting the alert and warning message to the desired Federal, state, and local officials. Also, consideration should be given to any additional capability a system may have for further dissemination of the alerting and warning message. The only true system with a current capability is the NAWAS system. Others are supplemental systems or concepts.

4.5.1 AP/UPI

The AP/UPI wire line is not a government system and is not designed to be a warning system. While it does serve regional CD offices and some Federal and state offices, it does not serve most.

It can play a major role by serving as one method of getting the news disseminated that a warning was issued. This will go to hundreds of radio and TV stations and other commercial and government activities equipped with AP/UPI terminals. Advantage should be taken of its valuable supplemental role.

4.5.2 National Weather Service Radio System

This system is a government system that is designed as a weather warning system. It is not tied in with the essential CD attack warning related activities except through other systems such as NAWAS. Its response time is slower than NAWAS.

It is an operational system that currently provides a very worthwhile capability to meet the state and local requirement of alerting the public in their homes by means of citizen-procured demutable home receivers. Many thousands of people have bought these receivers and receive severe weather alerts as well as routine weather reports on them. The system does not currently provide as good coverage as planned for DIDS nor is it survivable since most of the NWS offices are located in risk areas and their facilities are not designed for blast or EMP protection. Further the facilities need emergency power and the program lines linking the NWS office with the transmitter site are frequently long and not survivable.

4.5.3 Emergency Broadcast System

This is basically a non-government system that, by voluntary agreement with station management, provides national, state, and local government officials the opportunity to communicate with the general public. It has no inherent alerting capability. However, it is an excellent supplement to NAWAS due to its ability to quickly inform its audience of warning information. EBS is also the most logical way to provide follow-on information to personnel who have been alerted by an alarm system such as a siren. It is not designed or well-suited to be a backbone system by itself from a technical or operational viewpoint.

4.5.4 Telephone Alternatives

The NAWAS system is a special telephone alternative and is discussed below. The other techniques such as bell and light systems, group alerting systems, and the alerting of the total population by phone are not backbone oriented. The first two can be most helpful in fanning out the alert and warning and are discussed in the next section on state and local systems. Telephone alerting nationwide would provide exceptional coverage but the interruption of critical calls, of such a crucial time as when an attack warning needs to be disseminated, is not advisable. Further, the telephone system would be totally overloaded as most of the people, with phones in their hands after getting the warning, would have the urge to make a call to relatives or friends and the system could not handle it; thus, important official calls could not be made.

4.5.5 DIDS - DIDS/Transportable

The original DIDS system was a well conceived alerting and warning system that had the proven capability to provide excellent coverage as a backbone system and also to provide warning to the general public. Its coverage exceeded that planned for the NWS radio service. Also, DIDS LF band operation was less vulnerable to nuclear weapons impact on propagation than was the VHF band of the NWS weather radio system.

The vulnerability of the 10 fixed LF transmitter sites can be compensated for by the proposed mobile transmitter concept which is being analyzed under a separate study.

The DIDS and DIDS/Transportable systems are viable systems that could provide timely warning to all desired backbone locations (Federal, state, and local) and also to the general public. The major obstacles to DIDS, at this time, are the national policy selecting the NWS weather system as the only government sponsored home warning receiver system and the cost relative to the existing NWS system. However, from a technical and operational viewpoint, the DIDS/Transportable concept has excellent potential for serving as the base for a national warning system.

4.5.6 Data Systems

Modern automated data systems provide an additional method of disseminating warnings to backbone locations. A hard copy, in addition to the voice message, can provide confirmation and can be most helpful particularly on warning messages that contain instructions or data such as fallout information. The message that has to be relayed or may have to be referred to again for any reason is readily available.

Various data systems are available and could be incorporated into a national warning system on an interim or a full time basis. AUTODIN is a highly reliable system, with a priority feature, that would expedite dissemination of warning messages. NLETS is an automated system that currently ties into existing state law enforcement networks throughout CONUS. The NWS/AFOS can provide dissemination throughout the weather service.

4.5.7 Satellite System

With the decreasing cost of satellite systems, it is becoming more feasible to employ this transmission media for a major element of a warning system. Its excellent coverage, reliability, and flexibility are well-suited for regular or crisis relocation scenarios. By combining requirements with others users, the cost for the warning systems low volume requirements could be reduced. The presently proposed ESCS, for example, would make an excellent base for a modern warning system.

4.5.8 NAWAS

The NAWAS system is a proven backbone system that meets its requirement for getting the warning to the selected key Federal, state, and local officials. Its major weaknesses are its lack of survivability beyond the initial attack, and its limitations on expanding the number of backbone drops. Additionally, it does not directly alert the general public, which is a desirable feature for any warning system with critical time requirements.

4.6 BACKBONE EVALUATION RESULTS

The evaluation of the backbone systems produced the following findings:

1. No single system yet implemented or conceived fully meets all of the criteria for effective warning and recovery in the face of repeated emergencies.
2. Survivability requires redundancy. An integrated network, system engineered to function as a single redundant system, can be designed to meet the Nation's warning needs. By using multiple transmission media and utilizing capabilities available from shared use systems, survivability and reliable performance can be greatly enhanced. The hybrid system design should consider the following.
    a. Terrestrial land line - Upgraded NAWAS
    b. Terrestrial radio - Transportable DIDS/Nationwide NWS Radio
    c. Satellite - DCPA's ESCS
    d. Automated data features - NLETS/AUTODIN II.

Conclusions and recommendations covering both the backbone and state and local systems are presented in Section 6.

SECTION 5 - ASSESSMENT OF STATE AND LOCAL WARNING SYSTEMS

5.1 INTRODUCTION

Below the Federal government level, responsibility for civil preparedness, including warning, is vested in the states, each of which has a civil preparedness program. Within the area of each state, responsibility is further delegated to the thousands of cities, towns, and townships that have chosen to develop their own program. Unlike the Federal warning systems, many of the state and local systems encountered in the study are not made up of strictly dedicated warning communications systems like NAWAS. The warning communications systems used at the state and local level are usually dedicated to support other functions such as fire, rescue and police services, with their secondary role being that of supporting the civil defense warning requirement. In practical terms, few state and local civil preparedness agencies are motivated to establish or reserve warning capabilities for a possible future attack while their communities face the daily threat of a natural or man-caused non-war disaster. Despite the common emphasis upon the handling of immediate threats, the effectiveness of the various state and local programs--both their overall preparedness programs and their warning programs--are highly variable. To some extent the wealthier, more populous states and their larger subordinate jurisdictions have better, more modern communications and warning equipment, and therefore, have more effective warning programs. However, this situation is not uniformly true, since some states and local governments with better equipment simply depend upon their "brute force" capabilities to reach more people, while a few states and local governments with much less in the way of communications and warning equipment have made more sophisticated use of their resources.

5.2 STATE AND LOCAL WARNING ROLES

The state and local governments presently are a vital link in the dissemination of attack warning messages from the national level to the general population. The warning role of the state and local government can be seen in the following description of the Civil Defense Warning System taken from the "Civil Preparedness Principles of Warning," dated 30 June 1977.

"The Civil Defense Warning System (CDWS) was developed to provide a means of warning Federal, military, and civilian authorities, State and local officials, and the civilian population of an impending enemy attack or actual attack upon the United States. This remains as its principal use today. The use of the CDWS for emergencies related to peacetime nuclear incidents, railroad disasters, downed aircraft, and other hazardous events or disasters also is authorized. In recent years, the CDWS has been used extensively and found well suited for warning of natural disasters such as hurricanes, tornadoes, and floods. On May 22, 1974, the President approved the Disaster Relief Act of 1974, Public Law 93-288, which established a new base for the disaster activities of the Federal Government. The act authorized the President to utilize and make available Federal civil defense communications systems for the purpose of providing warning to governmental authorities and the civilian population in areas endangered by disasters. The authority has been delegated to the Secretary of Defense and redelegated to the Director, DCPA. Threats imposed by disasters make it imperative that all communities have an effective method of warning the public. DCPA communications and warning systems are particularly suited for disseminating warnings to State and local governments. Local governments are responsible for further fan out of warnings to other communities and the general public."

5.3 ASSESSMENT METHODOLOGY

The objective of this section is to assess the capability of the state and local warning systems to accomplish their role within the CDWS. The assessment involves investigating the hardware, manpower, and procedural components of the warning systems. As it is impossible within the constraints of this study to assess in detail each of the state and local warning systems within CDWS, an attempt is made to cover as many as possible in differing levels of detail. Three levels of assessment detail are presented in this report. The most detailed assessment was conducted on the Colorado State, El Paso County risk area, and Fremont County host area warning systems. Data used to conduct the assessment was obtained through an on-site survey of each of these jurisdictions in Colorado. The next level of assessment detail presented covers those states within DCPA Region 2. Data to conduct this level of assessment detail was derived from warning plans maintained at the regional headquarter. The remaining state and local warning systems within CDWS are assessed using data derived from the DCPA Program Status Report (PSR) data base. This section presents the methodology used to perform the assessment of the state and local warning systems.

5.3.1 Measure of Effectiveness (MOE)

Three measures of effectiveness (MOE) were developed to assess the adequacy of the state and local warning systems to fulfill their role within the CDWS. Since the state and local warning systems provide the critical link between the Federal warning system and the general population, the three MOEs chosen directly address this vital role. The three MOEs chosen are: (1) the propagation time of the warning message through the warning systems, (2) the population coverage, and (3) the survivability of the warning systems.

5.3.1.1 Propagation Time of the Warning Message

This measure of effectiveness addresses the time necessary to relay the warning through the state and local warning systems to the general population. The unit of measure of this MOE is minutes.

5.3.1.1.1 Importance of Propagation Time

Modern weapon technology has decreased the time available between detection of missile launch to impact of the weaponry to less than 10 minutes. Part of the 10 minutes must be allocated to the general population to initiate protective measures. Therefore, the warning system must be capable of disseminating the warning message from the Federal level to the general population in considerably less time than 10 minutes. Man-made and natural disasters are also time sensitive in nature. Considerable property damage and loss of life can be avoided if the warning system can alert the general public to the pending disaster in a timely manner.

5.3.1.1.2 Factors Contributing to Time Delay

The warning system's hardware, personnel, and procedures are contributing factors in determining the time necessary to disseminate the warning to the general public. Considerable savings in dissemination time can be realized if the warning system uses radio rather than telephone to fan out the warning message to subordinate warning points. Radio permits the parallel dissemination of the warning message to the subordinate warning points, i.e., all subordinate warning points can be contacted simultaneously; whereas, telephone fan out of the warning message, to the subordinate warning points, is commonly a sequential operation, i.e., subordinate warning points are contacted consecutively. The number of personnel available to place calls at the warning point can also impact the time necessary to disseminate the warning message. Many of the state and local warning systems encountered in this study use a combined radio and telephone fan out procedure to pass the warning message to subordinate warning points.

Another procedural point that can greatly impact dissemination time is whether or not the operator on duty at the local warning point has the authority to initiate the alarm system. If he must (as is sometimes the case) first contact a senior official, such as the Mayor or Sheriff, to obtain authority, considerable valuable time can be wasted tracking him or an assistant authorized to give the authority to sound the alarm.

A single operator at a warning point must perform the actions necessary to disseminate the warning message sequentially, while two or more operators can perform the fan out procedures in parallel, i.e., one operator notifies subordinate warning points via radio, while a second operator begins the telephone fan out. The fan out procedures used at the warning point directly affect the time necessary to disseminate the warning message. In cases where many telephone fan out calls are required, considerable time savings can be realized by using a prearranged procedure which calls for a person contacted, sharing the fan out responsibility, and contacting one or more additional personnel that must be notified. Obviously, where possible, prearranged conference calling should be used.

5.3.1.1.3 Determination of the Time Delay

State and local systems investigated in this study were assessed to determine the propagation time of the warning message from the state primary warning point to the local user activation point. The assessment involved determining the number of levels or points of manual intervention in each jurisdiction's warning system, the population coverage of each jurisdiction's warning system, and the communication means used to disseminate the warning message. This data was obtained through personnel interviews, review of warning plans and procedures, and visits to the jurisdiction's primary warning point. To facilitate the mechanics of the assessment, the following assumptions were made where data was not available.

1. In those jurisdictions where it was not possible to determine the coverage of the outdoor warning devices, 75 percent coverage of population in the area covered by the device was assumed

2. The time between initiation of the warning to the general public (activation of the outdoor warning devices) and the general public's receipt and recognition of the warning is 5 minutes

3. The elapsed time between each level in the warning fan out is 3 minutes (2 minutes to receive or transmit the warning and 1 minute to initiate an action such as activation of outdoor warning devices).

4. In those jurisdictions where it was not possible to determine the number of levels (points of manual intervention), the following formula was used:

$$L_R = 1$$

$$L_t = \text{Log}_2 \text{ (number of subordinate warning points)}$$

where

L_R = levels where warning is disseminated via radio broadcast

L_t = levels where warning is disseminated via telephone fan out

5. Where it was not possible to apportion the population coverage to each level of the fan out, the following formula was used:

$$P_c = \frac{N_T}{N_R+N_T}\left(\frac{T_c}{L}\right) + \frac{N_R}{N_R+N_T}\left(T_c\right) \text{(1st level)}$$

$$P_c = \frac{N_T}{N_R+N_T}\left(\frac{T_c}{L}\right) \text{(all other levels)}$$

where P_c = Population coverage of the level

N_T = Number of subordinate warning points notified by telephone

N_R = Number of subordinate warning points notified by radio

T_c = The total population coverage of the primary warning points (includes coverage of all subordinate warning points)

L = Number of levels in the primary warning point fan out procedure.

The methodology used to derive the time necessary to disseminate the warning to the general population is demonstrated in the following example.

County X receives its warning via NAWAS through the state warning point located in City A. County X's fan out procedure calls for the dissemination of the warning message to four subordinate warning points by radio and to ten other subordinate warning points by telephone. Each of the subordinate warning points activates outdoor warning devices within their control, thereby initiating the warning to the general public within the coverage area of their warning devices. A review of County X's warning plan reveals the coverage of each of the outdoor warning devices within the county's jurisdiction, but does not give an indication of the number of people available at the warning point or the prescribed procedure used in the telephone fan out. Table 5-1 summarizes the information derived from this survey of the sample warning plans.

Table 5-1. Information Derived from County X Warning Plan

Locality	Population	Warning Receipt Means	Fan Out	Percent of Population Warned
County X	25,000	NAWAS	Four subordinated warning points by radio and ten other subordinate warning points by telephone.	80

Using the assumptions contained in this section, it is determined that there are four levels within County X's warning system ($2^{3.33} = 10$). The estimated population coverage in each level is as follows:

$$P_{c\ \text{1st level}} = \frac{10}{14}\left(\frac{25,000 \times .80}{4}\right) + \frac{4}{14}\ (25,000 \times .80) = 9286$$

$$P_{c\ \text{2nd level}} = 3571$$

.
.
.

$$P_{c\ \text{4th level}} = 3571$$

Figure 5-1 can be constructed knowing the population coverage of each level, the dissemination time between each level, and the duration of the warning message. This figure graphically presents the warning coverage and the time necessary to disseminate the warning within County X. In this example, it would have been 8 minutes before the first group (9286) had received a 5-minute warning signal and 17 minutes by the time the last 18 percent (3571) of the 80 percent covered received a 5-minute warning signal.

5.3.1.2 Population Coverage of the Warning System MOE

This measure of effectiveness addresses the general population coverage of the state and local warning systems. The unit of measure of this MOE is the percentage of the total population covered by the warning system.

5.3.1.2.1 Importance of the Population Coverage MOE

The ultimate objective of the CDWS is to safeguard American lives in case of enemy attack. This means alerting agencies and activities that can assist in this vital mission. It also means providing early warning to the general public so that they can take appropriate, potentially lifesaving actions in the limited time available. Even under nuclear attack the simple act of taking advantage of the best available cover will greatly reduce casualties from immediate nuclear effects and fallout, outside of the immediate blast area. Thus, a key criterion for assessing the CDWS is the percentage of the population that will receive the advanced warning.

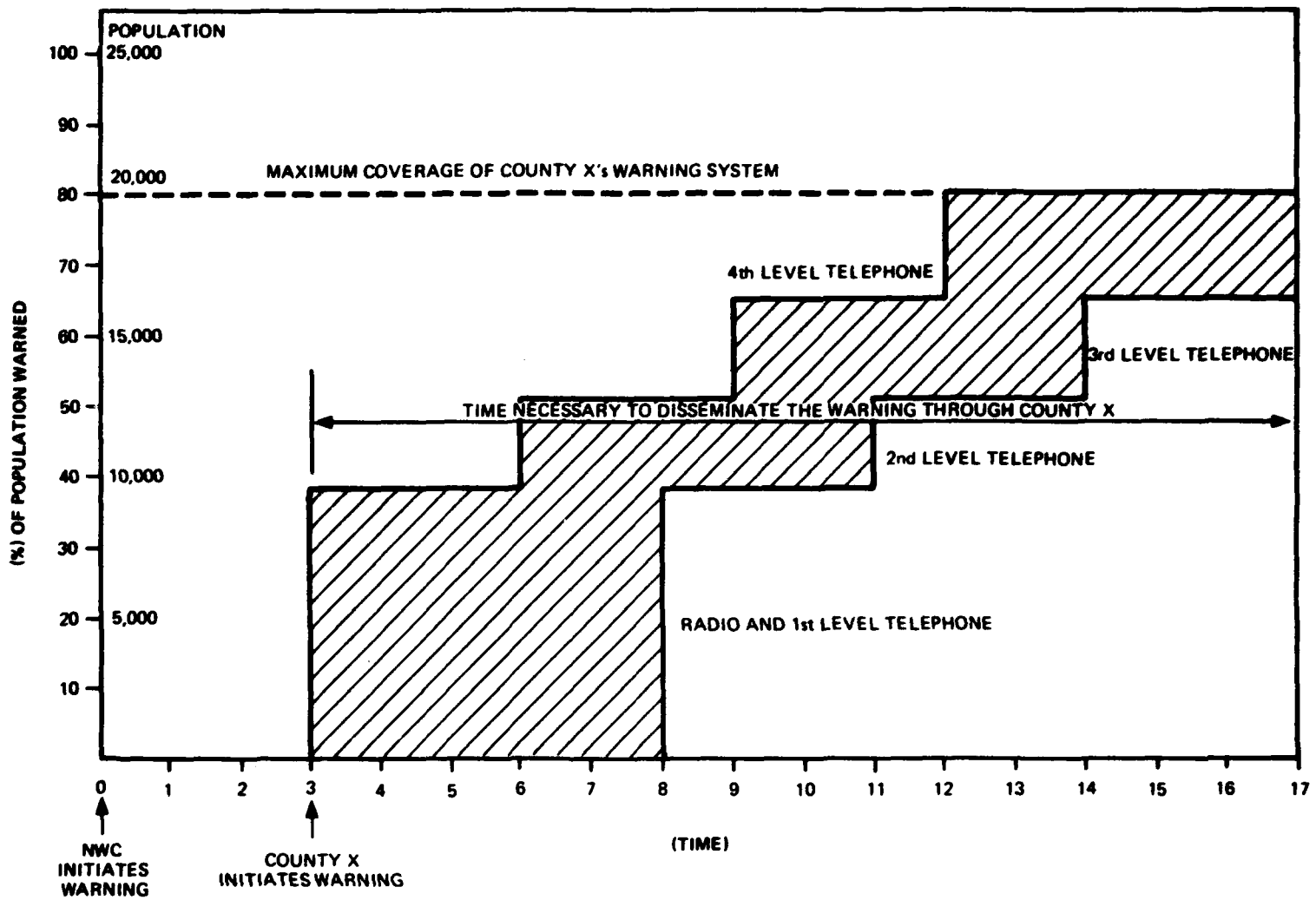


Figure 5-1. Effectiveness of the County X Warning System

The state and local warning systems must provide adequate coverage of the general population to ensure minimal loss of life and property in the event of a nuclear attack or a natural or man-made disaster. The requirement proposed for the Integrated Warning System calls for warning 90 percent of the population in 95 percent of the land area, 90 percent of the time.

State and local warning systems rely heavily on outdoor warning devices to disseminate the warning to the general public. Basically, these warning devices serve only to alert the public and do not provide specific instructions, rather they indicate that there is a danger and there is the need to obtain more information.

Unfortunately, outdoor warning devices are limited even in their alerting capability and are affected by wind and ambient noise in their capability to alert the public outdoors. Further they are highly ineffective, over a broad area, in alerting the public indoors, e.g., someone sleeping in a closed house with the air-conditioner running.

Regardless, they are still the principal means of warning the public and coverage figures based on siren warning potential will be used in this study as a guide to indicate population warning coverage. This will result in a maximum figure which may be reduced on a percentage basis to compensate for the inefficiency of outdoor warning systems.

Additional information on the coverage of the EBS, the primary network from which the public would receive information on the warning, is included in this study. The population coverage MOE is further complicated by the concept of crisis relocation. The crisis relocation concept calls for the evacuation of the general population from potential target (risk) areas to the outlying or fringe (host) areas. Under crisis relocation, the population may be moved from an area where adequate warning coverage is provided to an area where little or no warning coverage exists. The determination as to whether adequate coverage of the population is provided under crisis relocation

can only be assessed by surveying the host areas to determine whether the relocated risk area population is covered by existing warning devices. The data used to determine the population coverage MOE addresses only the population distribution, prior to the implementation of crisis relocations. Further study is required to determine the population coverage of the warning system under crisis relocation. It should be noted that the public, under crisis relocation conditions, would be more attentive and more responsive to a warning signal.

5.3.1.2.2 Population Coverage Contributing Factors

The primary factors in determining the population coverage of the warning system are warning system hardware and procedural methods of dissemination of the warning. The primary method to alert the population observed in the warning systems investigated is through the use of outdoor warning devices. The predominant outdoor warning device observed is the three-tone siren. The number of sirens within the state and local warning system is directly related to population coverage. Other outdoor warning devices noted during the assessment included bells, whistles, and mobile loudspeaker systems.

Procedurally the coverage of a warning system can be extended beyond that afforded by the outdoor warning devices through the effective use of the broadcast media. Few state and local systems analyzed during this study effectively utilized the broadcast media as a means to disseminate the warning. Many state and local civil defense planners contacted during this study believe the EBS system, when activated at the national level, will disseminate the warning to the general public via the commercial media. But the EBS system, under the present concept, is a Presidential information distribution system and does not possess an alerting role. Therefore, to effectively utilize the broadcast media as another medium to disseminate the warning to the general public, the state and local warning systems must include a local media/warning system procedural interface. This procedural interface consists of the agreements, plans, and procedures used to pass the warning message to the media station for transmission to the general public.

5.3.1.2.3 Determination of the Population Coverage MOE

The population coverage MOE addresses the coverage provided by the outdoor warning devices for the state and local warning systems. Area coverage of the outdoor warning devices is defined in OCD Manual FG-E-1.3, "Principles of Sound and Their Application to Outdoor Warning Systems" and the DCPA "Program Status Report." Data to develop this MOE was obtained from the siren inventories usually associated with the jurisdiction's warning plan or Part 5, "Alerting and Warning" of the Program Status Report.

To facilitate the mechanics of the assessment, the following assumptions were made.

1. The coverage figure contained in the jurisdiction's siren inventory is the population coverage of the jurisdiction's warning system
2. In the absence of a siren inventory for the jurisdiction, the coverage figure contained in Part 5 of the jurisdiction's PSR will be used as the coverage of the warning system
3. In the absence of both of the above items of data a coverage of 75 percent is assumed for the jurisdiction's warning system.

The jurisdiction's coverage MOE is the sum of the coverage of all the outdoor warning devices within the jurisdiction.

The methodology used to derive the coverage MOE is demonstrated in the following example. Table 5-2 presents the data obtained from a review of County Y's warning plan and siren inventory as an example.

Table 5-2. County Y's Coverage Data

Subordinate Warning Points	Type of Sirens	Population Coverage
City A	1-115 dB	1500
City B	2-125 dB	3000
City C	1-100 dB	1410
City D	2-100 dB	1000
City E	Unknown	Unknown
City F	Unknown	Unknown

County X has a population of 10,000. Data on the outdoor warning devices is available for all the subordinate warning points except City E and City F. A review of City E's PSRs reveals that 34 percent of the city's population is covered by its warning system. The population of City E is 1,000; therefore, coverage is provided for 340 people. City F has not submitted a PSR; hence, coverage data is not available for the city. City F's warning system is therefore assumed to cover 75 percent of its population of 1,000, or 750 people. The coverage afforded by County Y's warning system is the sum of the coverages in each of the subordinate warning jurisdictions. County Y's warning system provides coverage for 8,000 of its population of 10,000. Therefore, the coverage MOE for County Y is 80 percent.

5.3.1.3 Warning System Survivability

The survivability of the system, (backbone, state, and local NAWAS circuitry), will be determined by assessing the impact of a nuclear attack scenario on the circuits and nodes making up the system. It is assumed that the circuits and nodes will provide their intended function unless some action stops them directly or indirectly.

The scenario used was a DoD approved scenario for a JCS exercise. The results are discussed in classified Annex A.

Survivability is also an important factor in the case of natural disaster. Such events would naturally have a much more restricted locality for potential damage to the warning system.

5.4 COLORADO STATE AND LOCAL WARNING SYSTEM ASSESSMENT

Data to conduct the assessment of the Colorado state and local warning systems was obtained through a site survey of various warning points within the State of Colorado. The survey team visited the state alternate warning point at Golden, the county warning points in Fremont, El Paso, and Adams counties, and the Denver City warning point. The purpose of the survey was to obtain data on the hardware, manpower, and procedural aspects of each jurisdiction's warning system needed to perform the assessment of the total Colorado warning system.

5.4.1 Description of the State Warning System

The State of Colorado views its warning responsibilities as the dissemination of the warning message received from the Federal level through the state to the counties within the state. The counties, in turn, are responsible for alerting and informing the general public. The state warning system uses the NAWAS state circuit to propagate the warning message to various points within the state. These points, usually associated with the state police, in turn, fan out the warning message to the various counties within the state. The fan out from these points utilizes various communication networks, the

primary being the state police radio network. The state primary warning point is located in the state patrol office in Denver. This location is manned 24 hours a day. The alternate state warning point is located at the Colorado state emergency operations center (EOC) located in Golden. This facility is operated normally only during business hours, although during crisis periods it would be operated on a 24-hour basis. The intermediate nodes, the points where NAWAS terminates and the state fan out begins, are usually located in state patrol offices. These state patrol offices are manned on a 24-hour basis and are well suited to be intermediate warning points within the state system. The county warning points are located primarily in sheriff's offices, fire dispatch centers, and local police departments. Again, all of the county warning points are manned 24 hours a day and are well suited to be points of entry into counties.

5.4.1.1 NAWAS State Circuit

The NAWAS state circuit, GP-8232-081, connects the state primary and alternate warning points to 34 warning points within the state. Figure 5-2 shows the distribution of the NAWAS terminals within the state. The state circuit is connected to the Region 6 circuit GP-8232-067 through the state primary and alternate warning points. Warning messages originating at the Federal level are propagated directly to the NAWAS points within the state. Upon completion of a warning or test message, the state primary or alternate warning point conducts a roll call of the state warning points to ensure acknowledgment of the message. Included on the state circuit are NWS stations at Colorado Springs, Denver, Grand Junction, Limon, and Pueblo. These NWS stations can relay attack warning messages to the general public via VHF radio and can initiate natural disaster type warning messages to the various counties within the state. Figure 5-3 graphically portrays the fan out used in the Colorado state warning system. It also shows the terminal locations of the state microwave system and drops on the CCIC network.

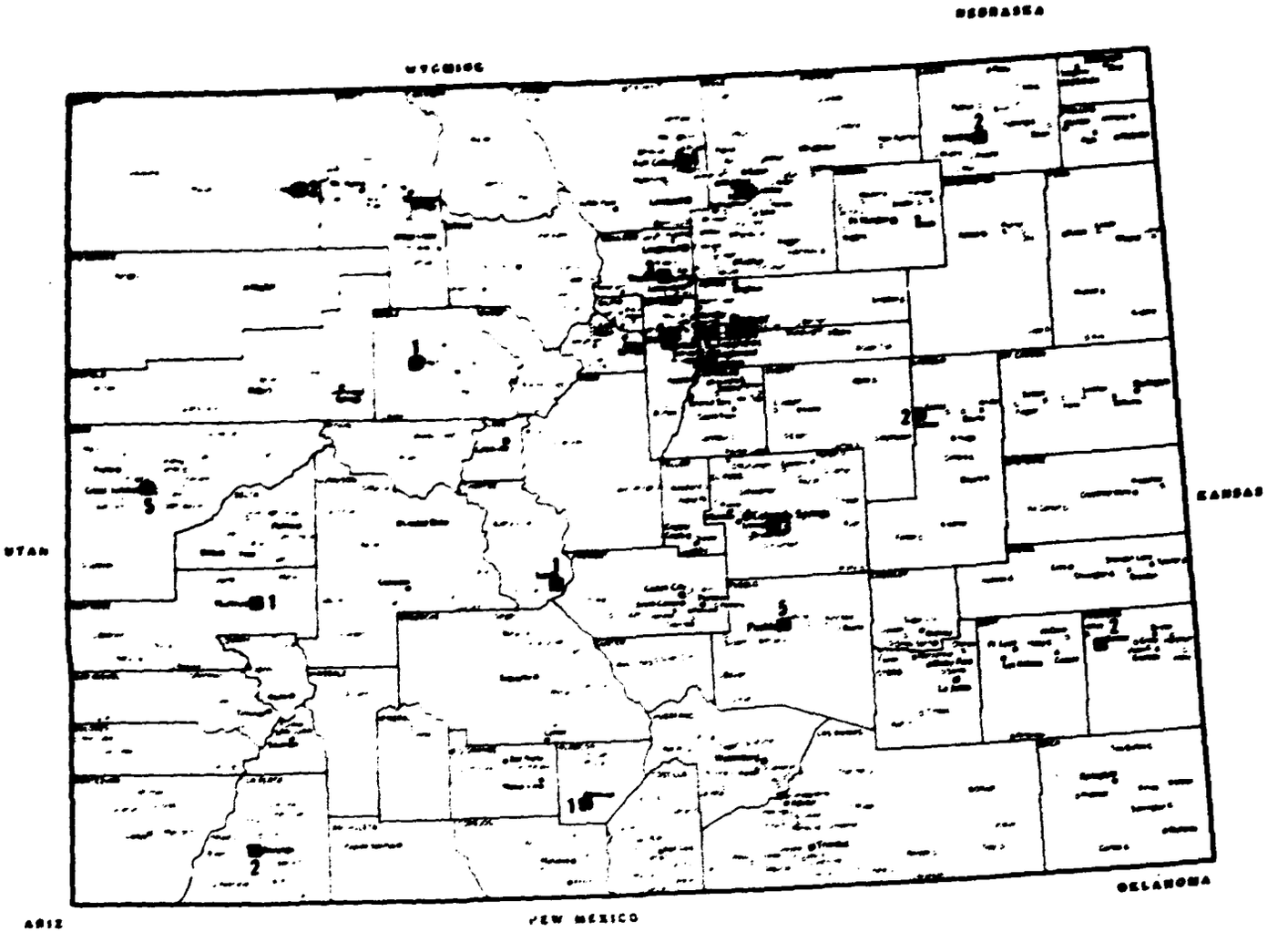


Figure 5-2. Distribution of NAWAS Drops in Colorado

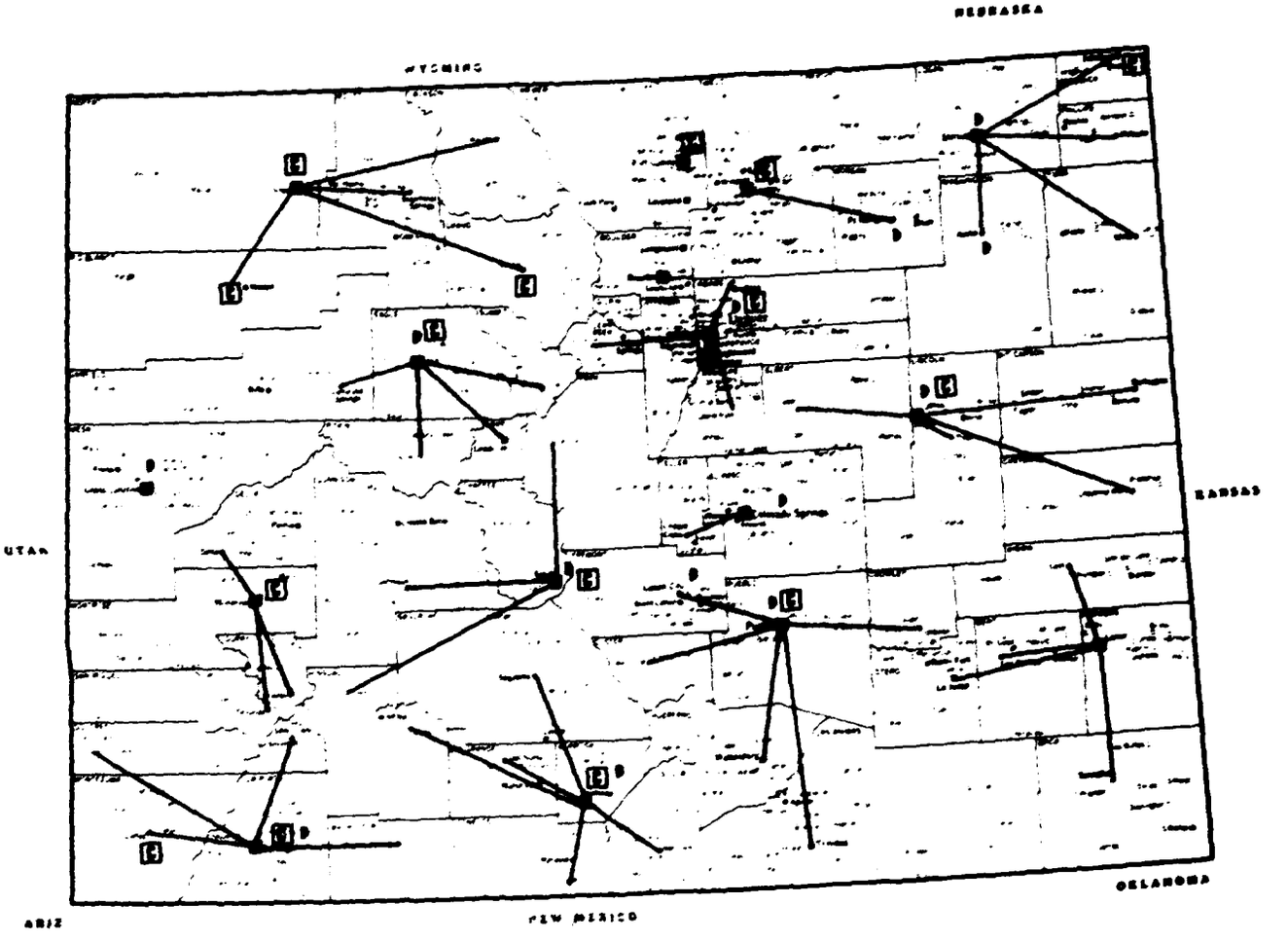


Figure 5-3. Colorado State Fan Out

5.4.1.2 State Patrol Radio

The state patrol radio system is the primary system used to fan out the warning message from the state NAWAS warning points to the counties. This system is shown in Figure 5-4. It primarily serves the Colorado State Patrol, but is also available to counties, cities, towns, and villages, if they can be accommodated without interfering with patrol operations. Primary use by county and local governments is in sheriff and police vehicles, but it can also be used in ambulances and by search and rescue teams.

The system operates on seven frequencies in the VHF (high band). Three of these frequencies are allocated to each of the six Colorado State Patrol divisions as defined in Table 5-3.

The system consists of locally controlled base stations, remotely controlled base stations tied to control points by wireline or microwave circuits, and repeaters. Remotely controlled base stations are almost always operated from offices also equipped with locally controlled base stations. Repeaters have been installed in remote areas to extend the service areas. They receive on one of the three frequencies available to a patrol division and retransmit on another of those frequencies.

Table 5-3. Allocation of Patrol Radio System Frequencies

Patrol Division	Channel 1 (MHz)	Channel 2 (MHz)	Channel 3 (MHz)
1	154.740	154.665	154.905
2	154.770	154.935	154.905
3	154.770	154.935	154.905
4	154.830	154.695	154.905
5	154.830	154.695	154.905
6	154.830	154.695	154.905

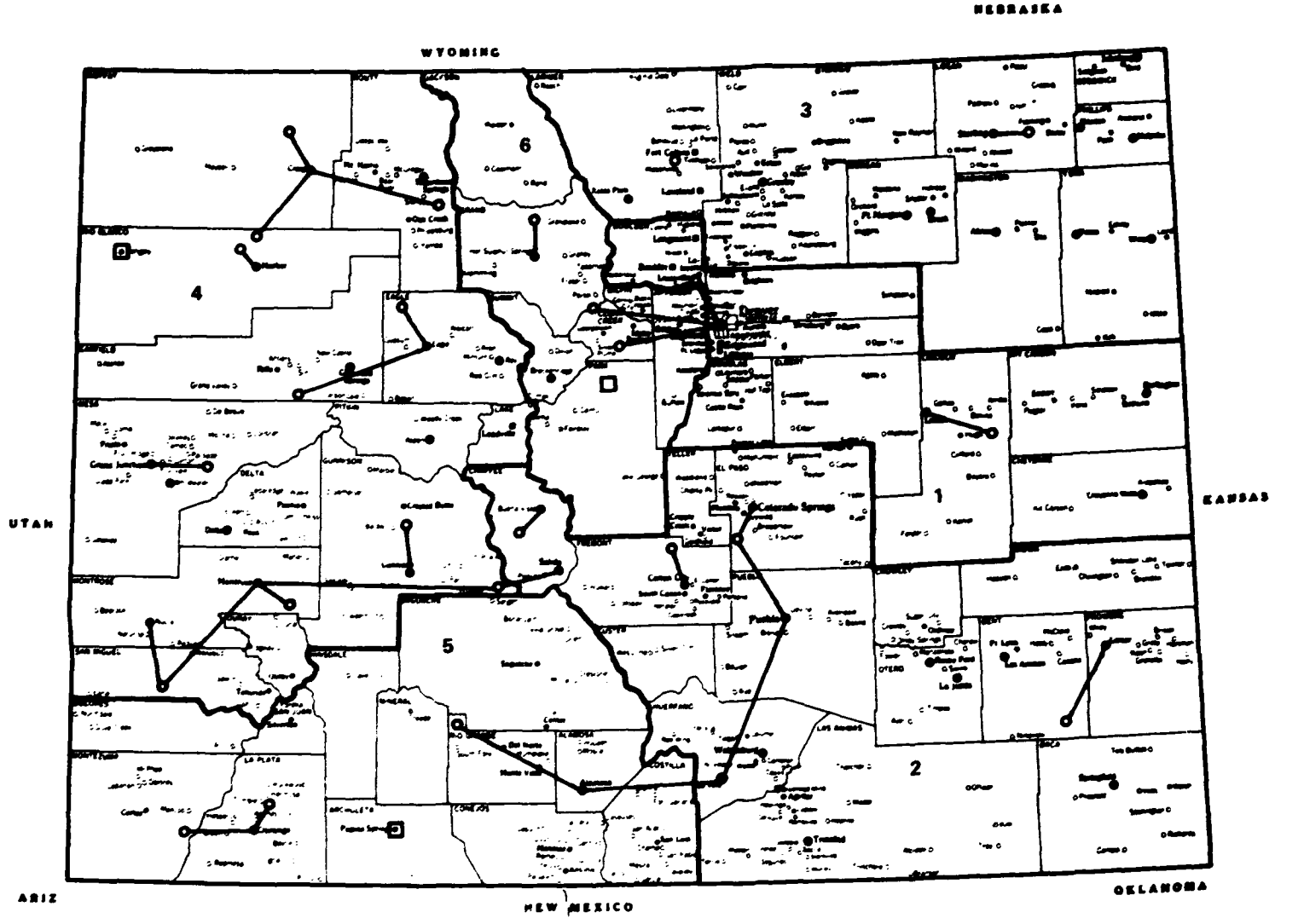


Figure 5-4. Colorado State Police Radio System

5.4.1.3 Other State Communication Systems Utilized in Warning

Other state communication systems used to back-up the NAWAS state circuit and state patrol radio are described in the following paragraphs.

5.4.1.3.1 Colorado Crime Information Center (CCIC) System

Terminals on the CCIC system were shown in Figure 5-3. The system is maintained by the Department of Local Affairs, Colorado Bureau of Investigation. It serves Federal, state, and local law enforcement agencies throughout Colorado. CCIC receives requests for information on wanted persons and wanted or stolen property (cars, boats, guns, etc.) over the systems, and it transmits responses back to the originating activity. Terminals include both teletypewriters and computer display devices. The system has an all-points capability. It can also be used for general purpose message communications. In the event of a nuclear attack or other major emergency, the system is used to disseminate the warning.

5.4.1.3.2 State Microwave System

The State Microwave System is shown in Figure 5-5. It serves the Colorado State Patrol; the Highway Department; the Department of Institutions; the Department of Military Affairs; Division of Disaster Emergency Services; and the Department of Natural Resources. The system is used to provide private telephone service and to control remote base stations. Subscriber locations on the state microwave system were shown in Figure 5-3.

5.4.1.3.3 State EBS Relay Network

The state will soon implement a state EBS relay network. The contemplated EBS network for the State of Colorado is shown in Figure 5-6. The primary common program control station (CPCS) for the state will be Station KOA (AM&FM) in Denver. The primary relay stations will be KVOR, Colorado Springs, for southeast Colorado, KUBC, Montrose, for southwest Colorado and KREX, Grand Junction, for northwest Colorado. Once implemented this will become another means to disseminate warning information to the general public.

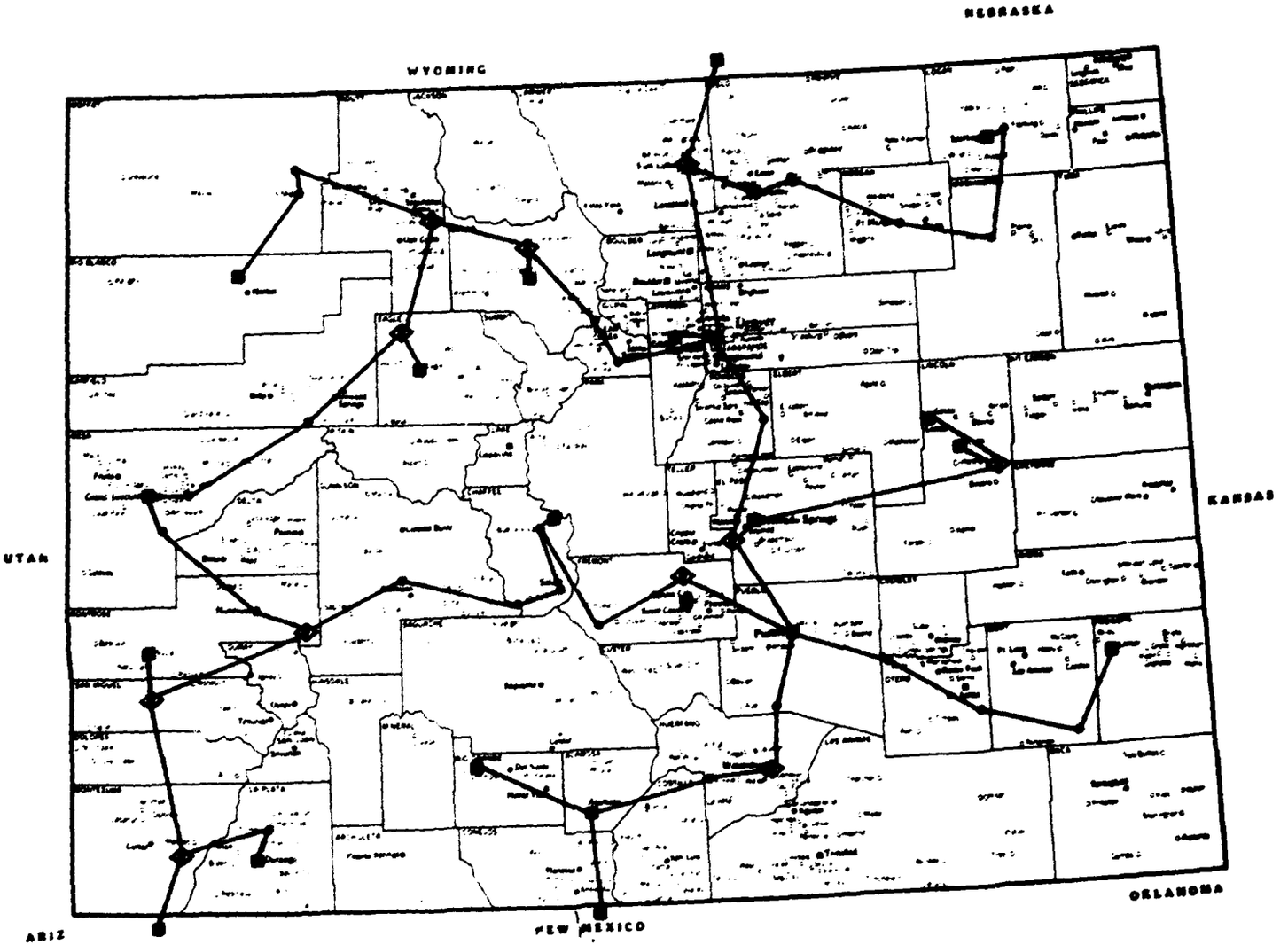


Figure 5-5. Colorado State Microwave System

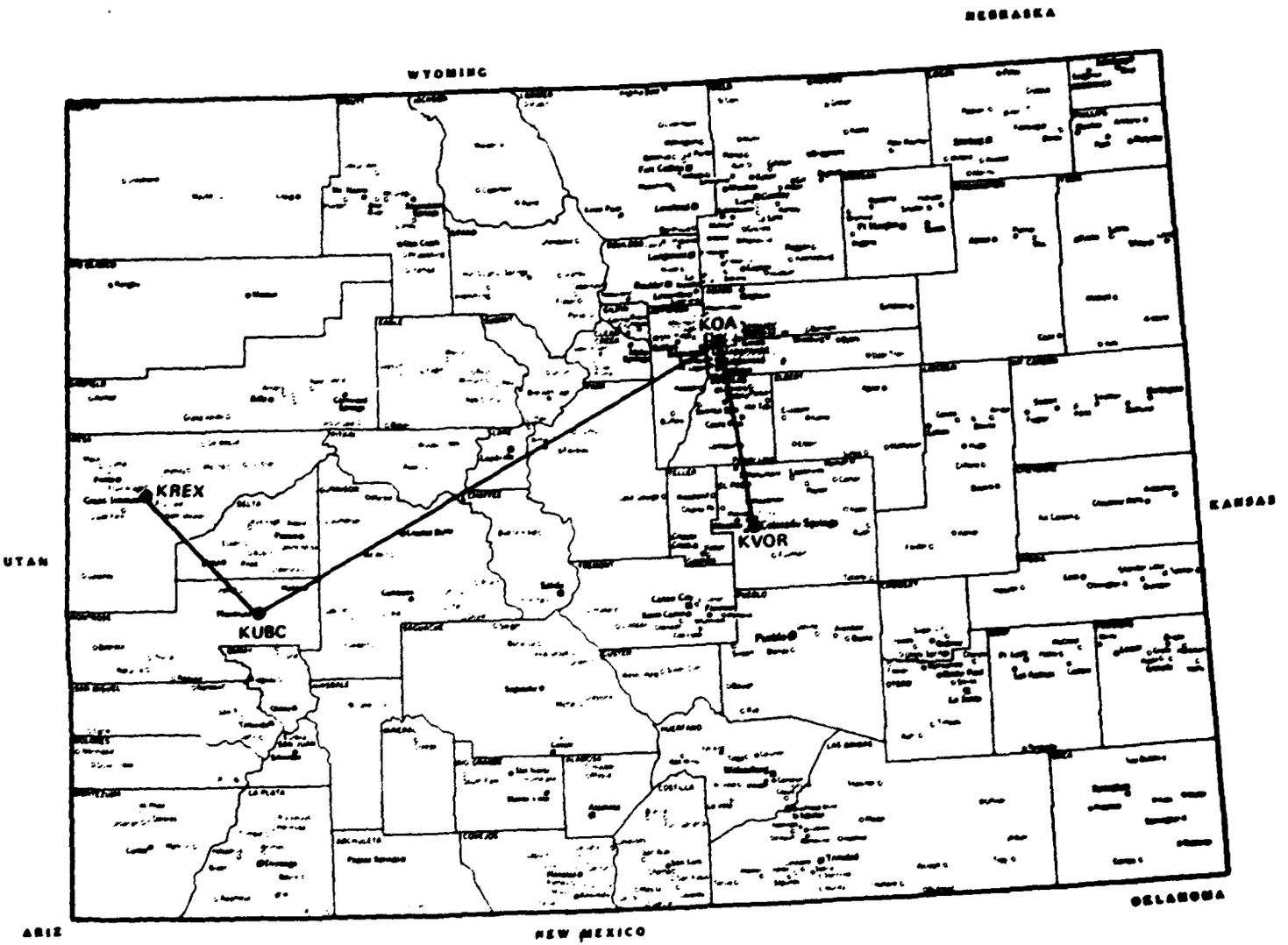


Figure 5-6. Colorado State EBS Relay Network

5.4.2 Definition of Local Warning Systems

According to the most recent PSR for Colorado, there are 85 jurisdictions within the state that require a warning plan or system. Since it was not possible within the constraints of the survey to visit all 85 jurisdictions, much of the data obtained on the local warning system came from a review of local warning plans and PSRs maintained at the alternate state warning point. The survey team did visit and collect data on the local warning systems associated with Adams County, El Paso County, Fremont County, and the City of Denver. A discussion of these local warning systems is presented in the following paragraphs.

5.4.2.1 El Paso County Warning System

The primary warning point for El Paso County is the Office of the Civil Defense Director. The alternate is the Colorado Springs Fire Department Dispatch Center. Both are located in the underground Colorado Springs EOC.

During normal business hours, control is exercised by the Civil Defense Director. During non-business hours, the fire dispatcher on duty receiving a warning will attempt to contact the Civil Defense Director. If he cannot contact him in 3 minutes, the fire dispatcher activates the warning plan on his own authority.

The warning is received on the NAWAS state circuit. Warning is disseminated by 30 outdoor sirens and fan out telephone calls to 35 county individuals and activities. The 30 sirens provide coverage of approximately 95 percent of the county's population, which is concentrated in Colorado Springs.

Of the 35 fan out contacts, 24 can be contacted directly on a single conference call. The remaining 11 must be contacted individually. Thirteen local radio and TV stations are included in this fan out network.

The overall status of the Colorado Springs/El Paso County warning organization was excellent. The personnel involved were highly motivated, well-informed, had well-prepared plans and procedures, and were in an excellent location in the underground EOC. The centralized outdoor warning system control provides rapid alarm activation capability. Progress was being made toward finalizing written, local EBS coordination plans and procedures.

The three problem areas noted are as follows:

1. The possible delay of up to 3 minutes after receiving a NAWAS warning, while attempting to contact the CD Director prior to activating the alarm, does not seem justified

2. The time required for the 11 individuals' calls would be time consuming. It is recognized that the alarm would be sounding during this period and the conference call completed, but a more rapid means of alerting these 11 persons/activities is desirable.

3. This system does not provide for a positive means for alerting people remote from Colorado Springs, such as at the small town of Calhan in eastern El Paso County.

5.4.2.2 Fremont County Warning System

The primary warning point for Fremont County is located in the Fremont County Sheriff's Office. The Fremont County Sheriff's Office would receive the warning from the Pueblo State Patrol Office by the state patrol radio. The officer on duty in the Sheriff's office upon receipt of the warning would call the State Penitentiary, 10 other towns and communities within the county, and Station KRLN. At present there are only four outdoor warning devices in all of Fremont County. They are located at the Canon City Fire Department, the Florence City Fire Department, the Penrose Warning Point, and the State Penitentiary. Each of these agencies is on the Sheriff's notification list. The four outdoor warning devices provide coverage for approximately 60 percent of the county's population.

A noticeable weakness in the state and local warning system was apparent during the survey team's visit to Canon City, Fremont County. The Civil Defense Director's position in Fremont County is a part-time position that had been vacant for many months and then filled shortly prior to the survey team's visit. The new Civil Defense Director was not aware of the alert warning procedures. A visit to the nearby Fremont County Sheriff's Office revealed that neither the officer on duty nor his supervisor was aware of the key role their office had in CD warning plans. At the request of the survey team, a check of the sheriff's log book was made and it was determined that during a statewide exercise held in August 1978, this office did receive and log a test warning message as part of that exercise.

Further, the CD Director was essentially uninformed of required actions as far as crisis relocation of personnel from the Colorado Springs high risk area to the Fremont County host area was concerned. Personnel working for the State of Colorado were actively developing such plans at their headquarters in Golden.

This situation was basically due to the long time position vacancy and the new Director's short time on the job. However, it does highlight the need for state and regional supervision and adequate manning at the local level.

The previous CD Director had other county related duties that were of a daily, immediate nature and apparently diverted his efforts from his CD responsibilities.

5.4.2.3 Adams County Warning System

The primary warning point for Adams County is located in the Adams County Communication Center. This facility, located in the Adams County EOC, provides central dispatching for the County Sheriff, and six community fire and police departments within Adams County. The Communications Center disseminates the warning to 23 points within the county by radio and phone. The County Communication Center is also a subscriber on the Denver Metropolitan Emergency Telephone System (METS) and thereby can contact directly local EBS stations for warning dissemination to the general public. This is an excellent, professionally run EOC. However, the county currently has only two outdoor warning devices, providing coverage for approximately 22 percent of the county's population.

5.4.2.4 Denver City Warning System

The primary warning point for the City of Denver is located in the Denver Fire Alarm Headquarters. The alternate warning point for the city is located in the city EOC in the basement of the City Courthouse. The alternate warning points assume the warning responsibility during business hours; the primary warning point is manned continuously, thereby assuming the warning role during non-business hours. The City of Denver has a terminal on the NAWAS state circuit in both the alternate and primary warning points. The primary or alternate warning point, upon receipt of a warning, activates the 51 outdoor warning devices in Denver, calls four individuals and agencies directly, and another 35 individuals and agencies on the METS. METS is a conference telephone network which ties together 35 key individuals and agencies in the Denver area on a common circuit. Of the 35 subscribers on METS, 12 are local EBS radio and TV stations. Denver's 51 outdoor warning devices provide coverage for approximately 85 percent of the city's population.

5.4.3 Warning Exercises

DCPA Region 6 now conducts region-wide attack warning exercises on a quarterly basis. In these attack warning exercises the Colorado state and local warning systems are exercised in their entirety. The purpose of these exercises is to provide training and practice at the state and local level in the activation and operation of the warning system. DCPA Region 6 personnel critique each of the warning exercises. Critique sheets are sent to each warning point within the state. Warning point personnel fill out the critique sheets, enter the time the warning was received and the time necessary to fan out the warning, and return them to the region where the data is compiled and analyzed. The results of the warning exercises are presented in Table 5-4. It was not known how many critique sheets were distributed prior to each of the exercises. The percentage contained in Table 5-4 reflects only those warning points which submitted critique sheets to Region 6. A review of the WARNEX-78-2 critique sheets revealed that many of the warning points expected the warning exercise to be conducted between 0900 and 1000 hours on August 23, when, in actuality, the exercise was conducted

Table 5-4. Results of Warning Exercises in Colorado

RECEIPT OF WARNING					
WARNEX	Date of Exercise	% Receiving Warning ≤ 2 min	% Receiving Warning > 2 min	% Not Receiving Warning	Number of WP Critique Sheets
78-1	March 8, 1978	74	21	5	38
78-2	August 23, 1978	38	39	23	69

FANOUT OF WARNING				
WARNEX	Date of Exercise	% Accomplish Fan out ≤ 15 min	% Accomplish Fan out > 15 min	% Not Accomplishing Fan out
78-1	March 8, 1978	66	34	0
78-2	August 23, 1978	49	45	6

at 1400 that day. The wide discrepancy in results of WARNEX 78-2 and 78-1 may be attributed to this fact. Therefore, it is assumed that the results of WARNEX 78-2 more accurately show what would transpire in a real warning situation.

5.4.4 Review of Warning Plans

The state civil preparedness office exercises managerial responsibility over the warning systems and programs in the state; therefore, it maintains a set of warning plans which covers the local warning jurisdictions in the state. According to the state's 1977 PSR, there are 85 jurisdictions within Colorado which require warning plans. Of the 85, 44 jurisdictions reported that they have current warning plans. The survey team reviewed 37 of the 44 warning plans; copies of the remaining 7 plans were not available. Many of the warning plans reviewed were of a good uniform format, each personalized to some degree for the local jurisdiction. In the early 1970s a team from a Colorado University had assisted the local jurisdictions in the preparing of their warning plans. It appears that the plans reviewed by the survey team were, in fact, the plans prepared in part by this team.

The quality of the plans varies widely with many being well modified to identify specifics appropriate to the local jurisdiction. Others basically read like a sample procedure with little specific guidance. Many of the plans lacked detail as to how the fan out was to be accomplished within the jurisdiction. A key sentence noted in many plans was the general statement, "The warning point will pass warning to subordinate political jurisdictions by the fastest available means of radio broadcasts, use of sirens, bells, whistles and mobile PA systems." Therefore, the detail required to assess the local system was, in many cases, not available. This required many assumptions to be made to determine the time and coverage MOEs. The currency of the warning plans reviewed is presented in Table 5-5.

Table 5-5. Currency of Warning Plans

Date Prepared Last Updated	Number of Plans
69	6
70	7
71	8
72	6
73	6
74	2
75	1
76	1
78	1
Total	37

Many of the plans contain telephone fan out lists, listing telephone numbers of key officials and subordinate warning points, which is proper. However, in that the plans had not been updated in several years, the validity of this data is highly questionable.

5.4.5 General Survey Observations

It was generally noted during the Colorado survey that the required qualified manpower and the hardware of the warning system exist, but the procedural aspects, such as plans and standard operating procedures (SOPs) do not exist at many locations visited. The key civil preparedness official in each jurisdicition visited generally knew how that jurisdictions warning system operated although the local plans and SOPs were nonexistent. The system would be subject to breakdown if the dispatcher, or an individual other than the civil preparedness director, received a warning at the warning point, and, lacking written instructions, did not know how to process and fan out the warning. Many of the dispatchers interviewed at the various warning points were not knowledgeable of the jurisdiction's fan out procedure. This uncertainty abrogates the warning system's effectiveness to reach the general public. The assessment conducted in this report addresses the limitations of the system provided all the noted procedural aspects of the system are followed.

5.4.6 Population Coverage of Warning System MOE

The population coverage MOE was derived using the methodology described in Paragraph 5.3.1 and the coverage estimates contained in the Colorado state PSR. Since Colorado stresses the use of the communication media to get the warning message to the general public, the assessment methodology was modified to include this factor. There was no way to validate the coverage estimates contained in the state PSR, since the necessary siren data (types, locations, etc.) was not available at the state or regional levels. The maximum outdoor coverage provided by outdoor warning devices in the state is approximately 47 percent of the state's population. This figure describes the percentage of the state's population within the coverage of the outdoor warning devices as defined in FG-E-1.3 "Principles of Sound and their Application to Outdoor Warning Systems." Realistically, the outdoor coverage afforded by the outdoor warning devices is not this high, as many people within the coverage area will be indoors where the ambient noise level or the attenuation of the building prohibits them from hearing the device's signal.

Data to determine coverage through the broadcast media was derived from NTI/NAC Audience Demographics Report, February 1976, and the 1977 Broadcasting Yearbook. The NTI/NAC Audience Demographics Report, prepared by the A.C. Nielsen Company, is a demographic survey of the public's TV viewing habits. The TV audience for various hours in the day and days in the week, as described in the report, are summarized in Table 5-6.

Table 5-6. TV Audience Composition

Day Part	% US Homes Using TV	Number of viewers per 1000 viewing homes
Monday-Friday, 10 am - 1 pm	23.4%	1,378
Monday-Friday 1 - 4:30 pm	31.1%	1,413
All nights, 8-11 pm	63.4%	2,041

According to the 1977 Broadcasting Yearbook, there are 890,613 TV households within the State of Colorado. From this and Table 5-6 the expected prime time (8-11 pm) audience size would be approximately 52 percent of the state's population. This varies depending upon the day of the week, special program interest, and many other interrelated items. As can be seen from Table 5-6, the time of day greatly impacts audience size. Going beyond the times shown in the table, it is logical that the audience decreases sharply after 11:30 as people go to sleep and stations go off the air for the night. Radio audiences follow different patterns. Radio audience peak times are the prime commuting times, 7:00 to 9:00 am and 4:30 to 6:30 pm. Additionally, many more radio stations than TV stations operate 24 hours a day.

When audiences are not watching and/or listening to their sets, there is no way conventional TV or radio can provide an alerting or warning capability. However,

the broadcast media can warn their watching/listening audience and provide additional confirmation and information for those who, after being alerted by an outdoor alarm system, turn on their radio or TV sets.

5.4.7 Propagation Time of Warning System (MOE)

The propagation time MOE was derived using the methodology described in Paragraph 5.4.3 and the data gathered during the Colorado survey. A 3-minute time period between levels was assumed; thus, the initiation of the 5-minute warning siren at the sixth level would start 18 minutes after warning was initiated by the NWC.

The number of people in the area coverage figures associated with an outdoor alarm system and those associated with area wide TV or radio households are not distinct and separate. In fact, they are basically redundant; therefore, they cannot be added. To illustrate the potential impact of the broadcast media supporting the warning system, the time phased chart showing the percentage of population covered by outdoor warning systems has a line added showing an estimate of the average number of viewers (52 percent of the state's population) that would be warned during the maximum audience period (8-11pm). See Figure 5-7.

Colorado stresses the use of the broadcast media to get warning information to the general public and includes many broadcast stations in their warning networks. The majority of the broadcast stations referenced in the state and local warning plans are notified in the 2nd and 3rd levels of the fan out structure. According to the 1977 Broadcasting Yearbook, there are three primary Areas of Dominant Influence (ADI) in Colorado, located in Denver, Colorado Springs, and Grand Junction. The ADI is a geographic market design that defines each TV market exclusive of others, based on measurable viewing patterns. Each market's ADI consists of all counties in which the home market stations receive a preponderance of viewing, and every county in the U.S. is allocated exclusively to only one ADI. The estimated TV households are therefore, additive, and the total of all ADIs represents the total

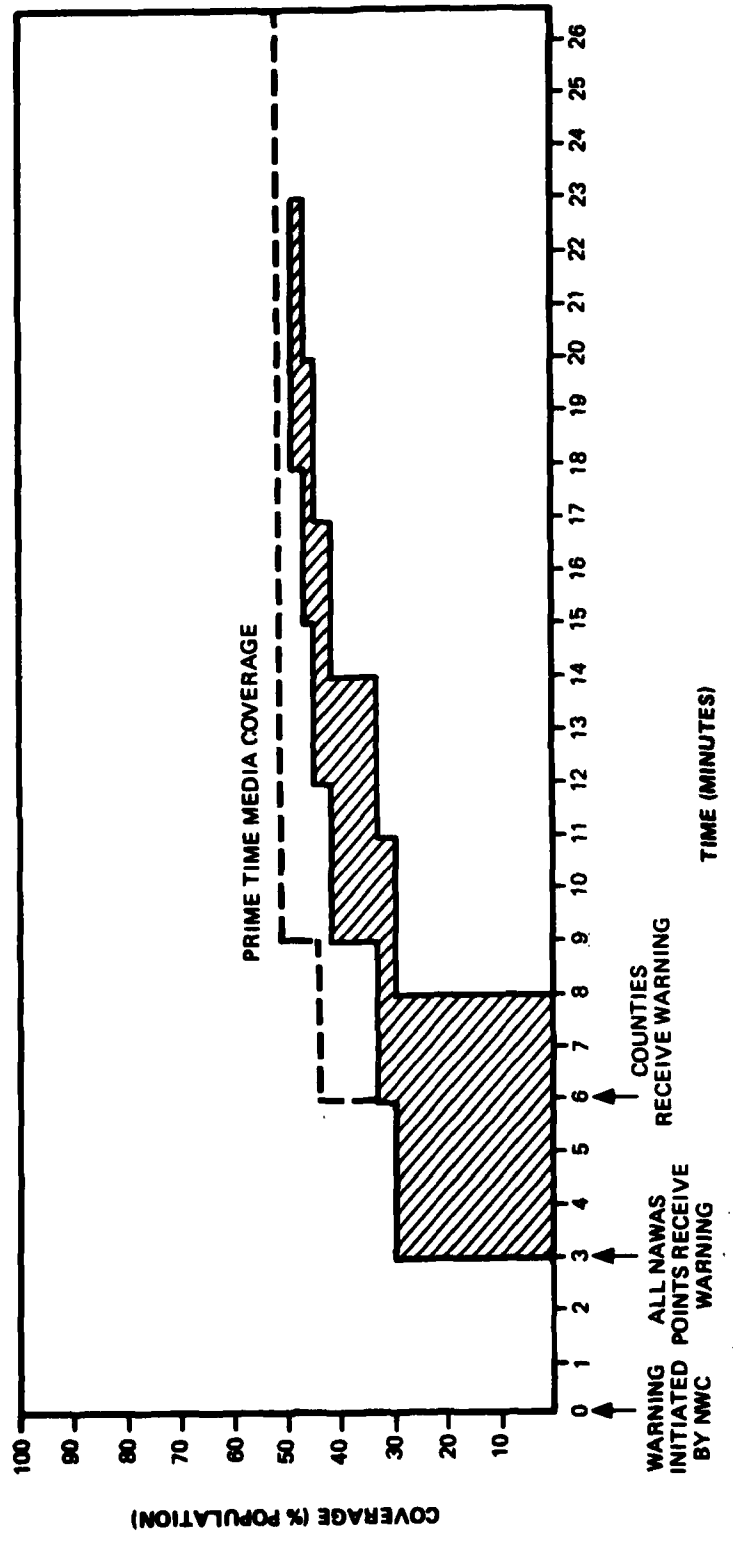


Figure 5-7. Colorado Coverage and Propagation Time MOEs

TV households in the U.S. The number of TV households and the percentage of the state population represented by each ADI are presented in Table 5-7.

Table 5-7. Distribution of Media Population Within Colorado

ADI	Number of Television Households	Percentage of State's TV Households
Denver	554,263	62
Colorado Springs/Pueblo	87,978	10
Grand Junction	70,382	8
Others	177,990	20
TOTAL	890,613	100

Twenty percent of the states' TV population is covered in ADIs whose home stations are outside of the state. The Denver and Colorado Springs home stations are notified in the 2nd level of the warning structure (6 minutes). The Grand Junction home stations are notified in the 3rd level of the warning structure (9 minutes). The maximum coverage line is based on the 8-11 pm audience size. Large segments of the population of many of the counties in Colorado could receive the warning via the commercial media before the local jurisdiction activates its outdoor warning devices. The significance of this is that the propagation time of the existing warning system can be shortened through the effective use of the broadcast media.

5.4.8 Warning System Survivability MOE

The network connectivity for the state warning system is shown in Figure 5-8. Information used to construct this figure was derived from the state warning plan and the AT&T circuit card for circuit number GP-8232-081. It can be seen in the figure that the key node in the network is located in an AT&T facility in Denver. Not shown in the figure is that the Denver AT&T facility is also the electrical access point for the Region 6 circuit into the state network. Denver has been identifted as a risk area by DCPA, a potential targeted area. Therefore, the survivability of the AT&T facility is questionable. Other key nodes in the network are located at the AT&T

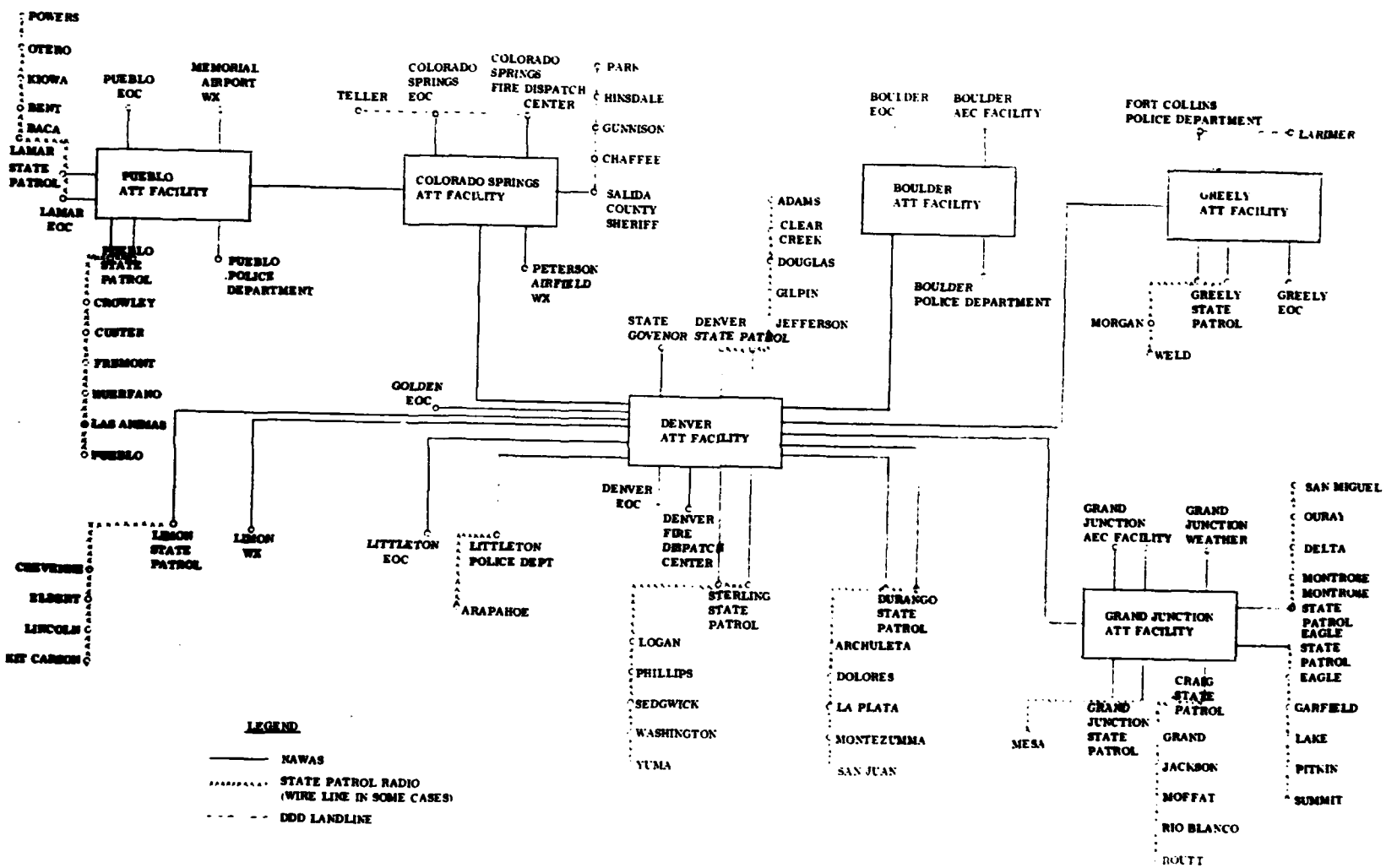


Figure 5-8. State Warning System Connectivity

facilities at Pueblo, Colorado Springs, Greeley, Boulder, and Grand Junction. All these stations with the exception of Grand Junction are located in risk areas. The survivability MOE is presented in Figure 5-9. This figure shows an example of degradation of Colorado state and local warning systems as the result of a general nuclear attack scenario. The state and local warning system would be capable of disseminating the warning message to the general population within its coverage for the initial attack, but would require major reconstitution to disseminate the warning in any subsequent attacks. State and local CD officials interviewed questioned the need for a survivable warning network. Following an initial attack various communications systems such as CDNARS, CDNAVS, and CDNATS and national, state, and local EOC would be activated. In Colorado, the various EOC will be tied together through various state radio networks. The state and local CD personnel interviewed believe that these activated radio networks and EOC will assume the warning responsibility, therefore, negating the requirement for a survivable dedicated warning system. These networks also would suffer degradation, particularly any using land-line facilities or with control points in high risk areas.

Clarification of policy is required on the need for survivability of the national warning system beyond the initial attack. Personnel at all levels, Federal through local, should be advised of the policy so that they can properly plan and support the policy. In any case state and local plans should provide for supplementing NAWAS with defined state and local systems and written guidance should be provided on authorities and procedures to be followed in the event of failure of the NAWAS.

5.4.9 Conclusions

The following conclusions were drawn from the assessment of the Colorado state and local warning systems.

- The present state and local warning systems provide coverage for approximately 50 percent of the state's population

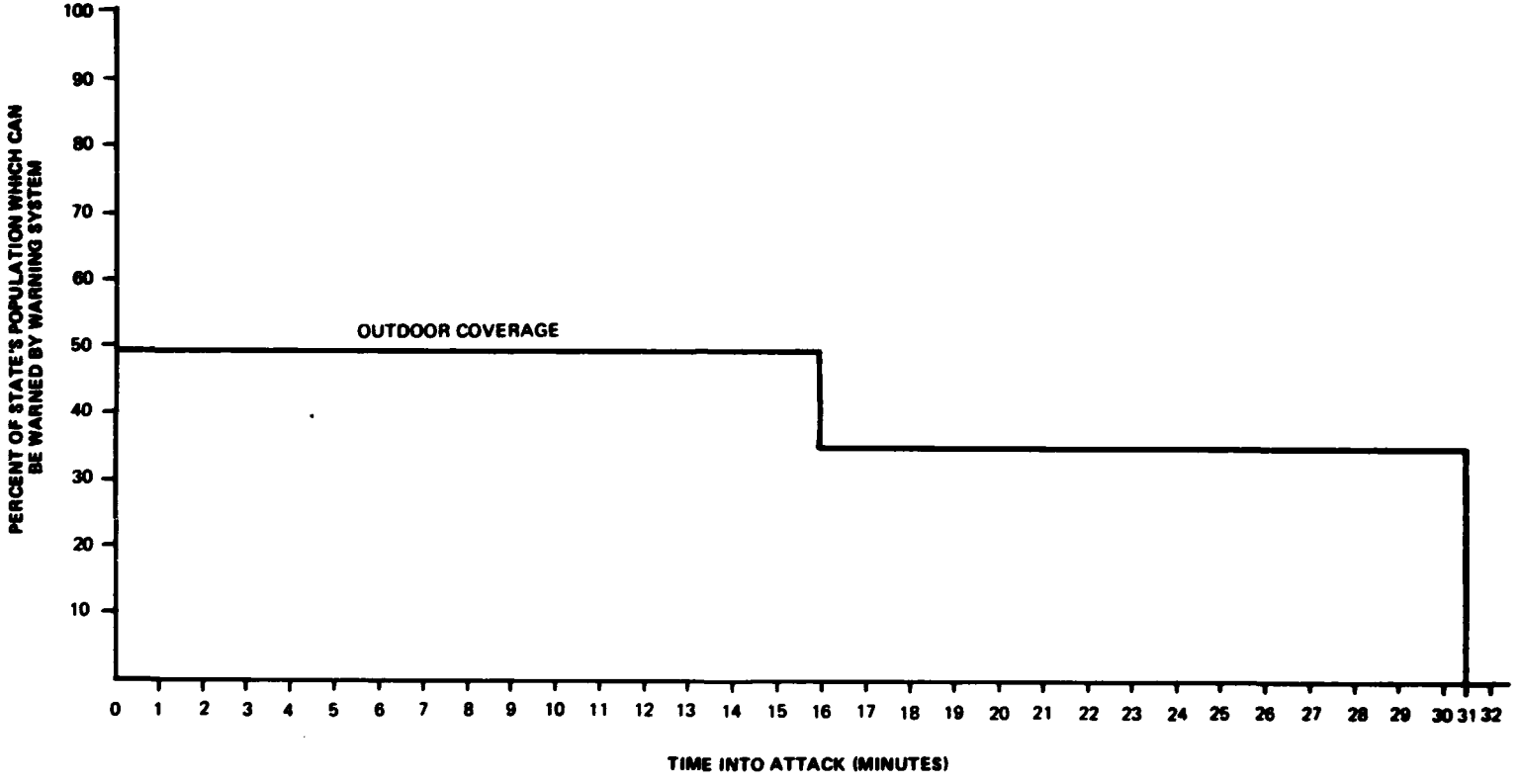


Figure 5-9. Illustrative Degradation of Colorado Warning System

- The state and local warning system is capable of providing the warning message to the state and local officials and the general population for an initial attack, but is highly vulnerable to enemy action
- Additional manpower/support is required at the regional or state level to monitor, supervise and assist local CD planning and operations efforts. This would include collection and review of CD plans for all 85 jurisdictions. Plans should be updated and include crisis relocation provisions
- Written agreements with local TV and radio stations should be accomplished at all levels
- Improved fan out capability and procedures should be formulated including provisions for crisis relocation situations.

5.5 ASSESSMENT OF THE STATE AND LOCAL SYSTEMS WITHIN REGION 2

Data to perform the assessment on the state and local warning systems in Region 2 was obtained from a survey of the warning plans maintained at the regional center. The methodology used to collect the data and perform the assessment is contained in Paragraph 5.2.

5.5.1 States Maintaining Warning Plans at the Region Headquarters

Not all states or local jurisdictions maintain warning plans at the Regional Warning Center. Those states and local jurisdictions which participate in the Federal matching funds program are required, as a prerequisite to obtaining Federal funds, to maintain a current copy of their jurisdictions's emergency communications and warning plans at their respective regional warning center. Table 5-8 summarizes the warning plans present at the Region 2 warning center by state. It can be seen that very little data was available on Delaware, West Virginia, and Virginia; therefore, it was not possible to accurately assess the warning systems within these states.

Table 5-8. Region 2 Warning Plan Summary

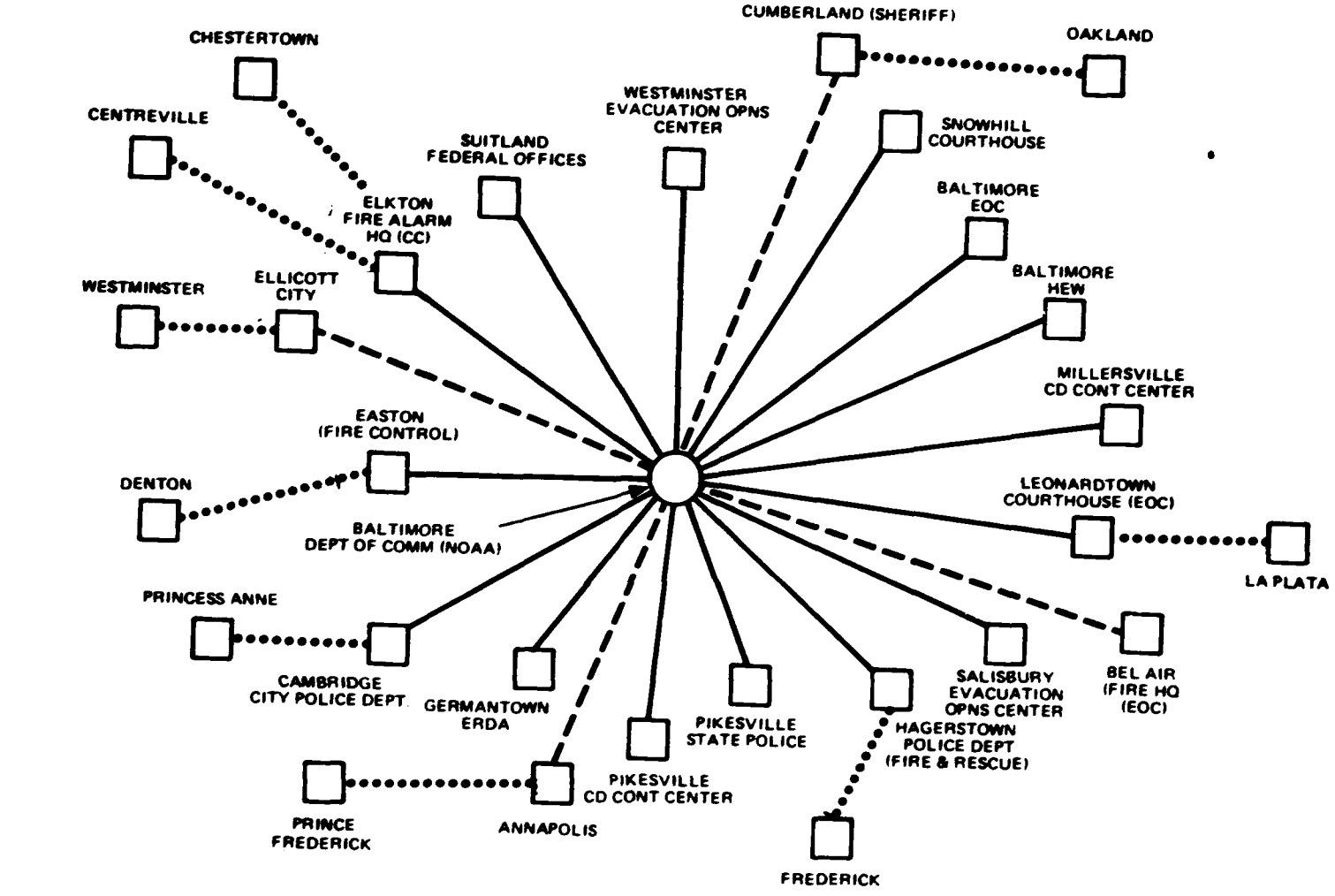
STATE	STATE PLAN	NO. OF COUNTIES WITHIN STATE	COUNTY WARNING PLANS AT THE REGION 2 WARNING CTR.	
			NUMBER	PERCENT
Delaware	Yes	3	0	0
Maryland	Yes	23	18	78
Pennsylvania	Yes	67	47	70
Virginia	Yes	95	9	9.5
West Virginia	Yes	55	6	11

5.5.2 Assessment of the Maryland State and Local Warning System

The primary warning system used in the State of Maryland to disseminate the warning message to the counties within the state is NAWAS. Below the counties serviced by NAWAS drops the warning message is further disseminated to the remaining counties within the state through a telephone and radio fan out procedure. Each of the counties upon receipt of the warning message activates its outdoor warning systems to disseminate the warning to the general population within its jurisdiction.

5.5.2.1 Definition of the Maryland State and Local Warning System

The state primary and alternate warning points are located in Pikesville, Maryland. Both of these warning points are connected to various county warning points within the state by NAWAS circuit GP-4285-014. From the counties serviced by NAWAS terminations, the warning message is disseminated to the remaining counties not serviced by NAWAS through the AT&T dial telephone system and local public service and safety radio networks. The NAWAS terminations and the fan out from these terminations are shown in Figures 5-10 and 5-11. Many of the primary



LOCATIONS NOT IN DCA DATA BASE

1. FRIENDSHIP AIRPORT WX
2. MARLOW HEIGHTS WX

LEGEND

- STATE NAWAS CIRCUIT GP-4285-014
- ASSUME NAWAS CONNECTIVITY NOT SHOWN IN DCA DATA BASE
- STATE FANOUT

Figure 5-10. Connectivity of Maryland State Warning System

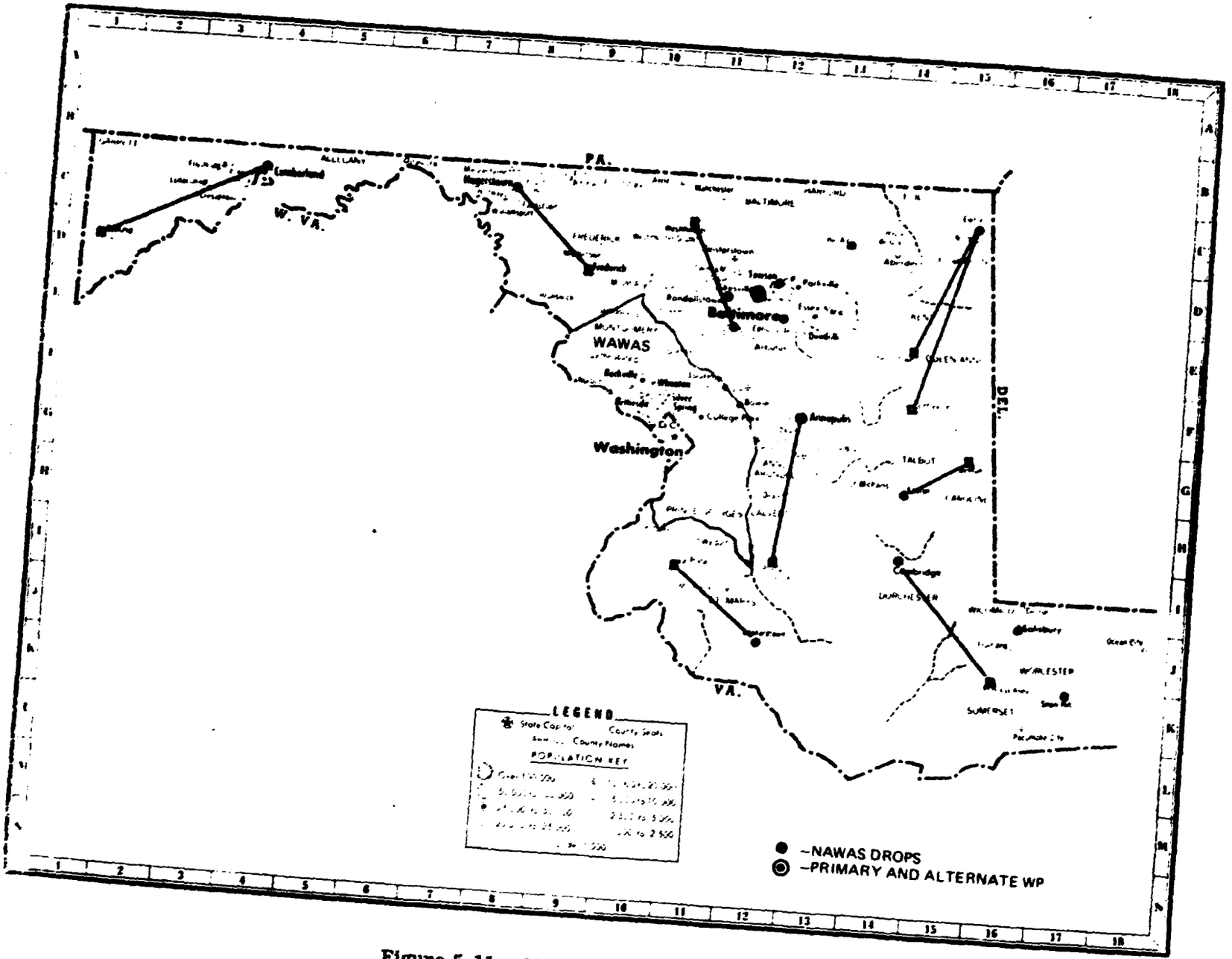


Figure 5-11. Maryland State Fan Out

county warning points were found to be in local fire dispatcher's offices or county sheriff's offices. These locations are well suited as warning points since they are operational 24 hours a day.

Maryland has 23 counties of which 12 have NAWAS drops and 9 are served by telephone or radio fan out. Additionally, two of the most populous counties, Prince Georges and Montgomery, are served by the WAWAS. This system, serving the District of Columbia and the adjoining areas in Maryland and Virginia, is activated by personnel at the Region 2 Warning Center. Figure 5-12 and Table 5-9 provide a diagram of the Maryland warning structure and related information to include the counties, their population, the fan out procedure, the number of sirens, and estimated population coverage.

As can be seen from the connectivity diagram in Figure 5-10, the state warning circuit GP-4285-014 is essentially a star configuration with a single hub in Baltimore, a high risk area. The loss of this one facility would eliminate the state warning network.

Table 5-10 shows the timing as the significant steps occur in the warning cycle. Figure 5-13 portrays graphically the percentage of the population covered by the warning system during the warning cycle.

5.5.2.2 Assessment

The Maryland state and local warning system appears on a comparative basis to be an above average system with a reliable limited prestrike attack warning capability and a natural disaster warning capability. However, it suffers from serious weaknesses which include:

1. The entire network is dependent upon the single hub in Baltimore, a high risk area. This one facility could be lost due to sabotage, bombing or natural disaster and the state system would be gone

2. The system is dependent upon time consuming multiple fan out procedures to reach many local agencies

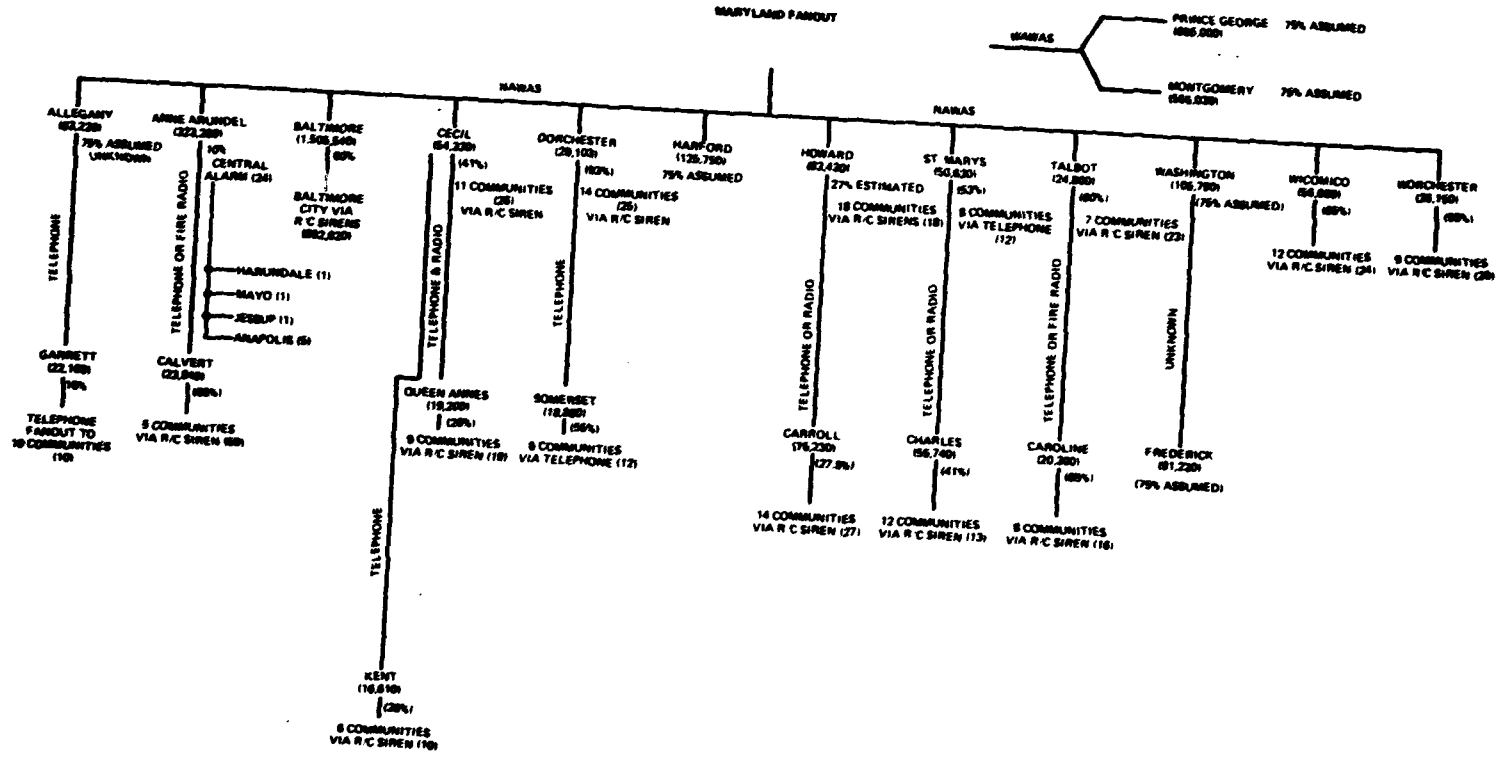


Figure 5-12. Maryland Warning Fan Out Structure

Table 5-9. Maryland State Warning Plan Summary (1 of 2)

LOCALITY	POPULATION	WARNING RECEIPT MEANS	FAN OUT	% POPULATION WARNED	NUMBER OF OUTDOOR WARNING DEVICES	DATE OF WARNING PLAN
ANNE ARUNDEL COUNTY (COUNTY FIRE DEPT)	323,280	NAWAS	4 COMMUNITIES VIA RADIO CONTROL SIRENS, CALVERT COUNTY	10 (ESTIMATE)	32	SEPT 1969
CALVERT COUNTY (CD CONTROL CENTER)	23,840	TELEPHONE OR FIRE RADIO FROM ANNE ARUNDEL COUNTY	5 COMMUNITIES VIA RADIO CONTROL SIRENS	65	50	DEC 1977
CAROLINE COUNTY (COUNTY FIRE DEPT)	20,300	TELEPHONE OR FIRE RADIO FROM TALBOT COUNTY	8 COMMUNITIES VIA RADIO CONTROLLED SIRENS	65	16	JULY 1978
CARROLL COUNTY (COUNTY FIRE DEPT)	76,230	TELEPHONE OR FIRE RADIO FROM HOWARD COUNTY	14 COMMUNITIES VIA RADIO CONTROLLED SIRENS	27	27	APRIL 1970
CECIL COUNTY	54,330	NAWAS	11 COMMUNITIES VIA RADIO CONTROLLED SIRENS, QUEEN ANNES AND KENT COUNTIES	41	26	AUG 1971
CHARLES COUNTY (CD CONTROL CENTER)	55,740	TELEPHONE OR FIRE RADIO FROM ST. MARYS COUNTY	12 COMMUNITIES VIA RADIO CONTROLLED SIRENS	41	13	JULY 1978
DORCHESTER COUNTY (POLICE DEPT)	29,130	NAWAS	14 COMMUNITIES VIA RADIO CONTROLLED SIRENS	93	25	JUNE 1978
GARRETT COUNTY (SHERIFF'S OFFICE)	22,160	TELEPHONE FROM ALLEGANY COUNTY	TELEPHONE FAN OUT TO 10 COMMUNITIES	16	10	FEB 1971
HOWARD COUNTY	83,430	NAWAS	18 COMMUNITIES VIA RADIO CONTROLLED SIRENS	27 (ESTIMATE)	18	APRIL 1978
KENT COUNTY (SHERIFF'S OFFICE)	16,610	TELEPHONE FROM CECIL COUNTY	6 COMMUNITIES VIA RADIO CONTROLLED SIRENS	36	10	JULY 1978
MONTGOMERY COUNTY	566,030	WAWAS	UNKNOWN	75 (ESTIMATE)	UNKNOWN	JULY 1974
PRINCE GEORGES COUNTY	696,000	WAWAS	UNKNOWN	75 (ESTIMATE)	UNKNOWN	AUG 1974
QUEEN ANNES COUNTY	19,200	TELEPHONE OR FIRE RADIO FROM CECIL COUNTY	9 COMMUNITIES VIA RADIO CONTROLLED SIRENS	26	19	FEB 1978
SOMERSET COUNTY	18,880	TELEPHONE FROM DORCHESTER COUNTY	TELEPHONE FAN OUT TO 6 COMMUNITIES	55	12	MAR 1978
ST. MARYS COUNTY (EOC)	50,620	NAWAS	TELEPHONE FAN OUT TO 8 COMMUNITIES AND CHARLES COUNTY	53	12	MAY 1978

Table 5-9. Maryland State Warning Plan Summary (2 of 2)

LOCALITY	POPULATION	WARNING RECEIPT MEANS	FAN OUT	% POPULATION WARNED	NUMBER OF OUTDOOR WARNING DEVICES	DATE OF WARNING PLAN
TALBOT COUNTY (CENTRAL FIRE CONTROL)	24,800	NAWAS	7 COMMUNITIES VIA RADIO CONTROLLED SIREN AND TELEPHONE/ RADIO TO CAROLINE COUNTY	60	23	APRIL 1978
WICOMICO COUNTY (COUNTY COURT HOUSE)	56,660	NAWAS	12 COMMUNITIES VIA RADIO CONTROLLED SIREN	65	24	FEB 1978
WORCESTER COUNTY (FIRE ALARM HEADQUARTERS)	26,150	NAWAS	9 COMMUNITIES VIA RADIO CONTROLLED SIREN	95	20	APRIL 1978
ALLEGANY COUNTY	83,220	NAWAS	NO WARNING PLAN AT REGION HQ	75 (ASSUMED)	–	–
HARFORD COUNTY	125,750	NAWAS	NO WARNING PLAN AT REGION HQ	75 (ASSUMED)	–	–
WASHINGTON COUNTY	105,790	NAWAS	NO WARNING PLAN AT REGION HQ	75 (ASSUMED)	–	–
FREDERICK COUNTY	91,230	FAN OUT FROM WASHINGTON COUNTY	NO WARNING PLAN AT REGION HQ	75 (ASSUMED)	–	–
BALTIMORE COUNTY (FIRE DISPATCHER)	1,505,540	NAWAS	BALTIMORE CITY ONLY VIA RADIO CONTROLLED SIRENS	80	38	–

Table 5-10. Maryland Warning Cycle Events

TIME (MIN.)	PERCENT OF POPULATION RECEIVING WARNING	REMARKS
0	(0)	Alert initiated by NWC
1		
2	945,772 (23)	WAWAS initiated by ANWC
3	1,557,553 (39)	NAWAS Drops initiate warning sirens fan out
4		
5	2,407,164 (59)	1 st Level initiates warning sirens
6		
7	2,426,432 (59.56)	2nd Level initiates warning sirens
8		
9	2,430,779 (59.67)	3rd Level initiates warning sirens
10		
11	2,431,665 (59.69)	4th Level initiates warning sirens
12		
13		
14		
15		
16	2,431,665 (59.69)	Basic warning cycle completed
17		
18		
19		
20	Maryland Population–4,073,940 (100)	

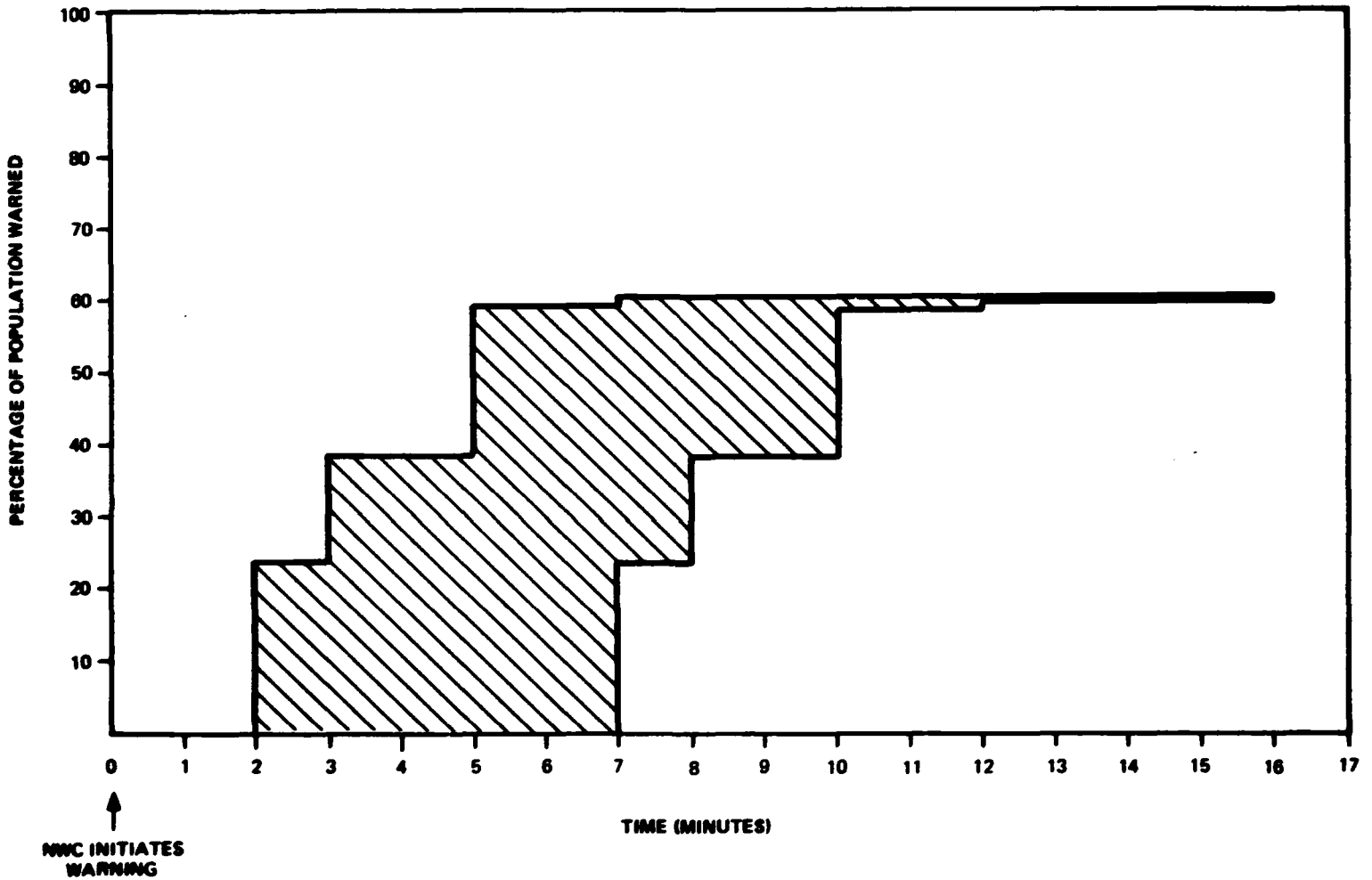


Figure 5-13. Maryland Population Warning Times

3. Alerting the general public is primarily dependent upon outdoor alarms which at maximum would cover only 60 percent of the population.

5.5.3 Assessment of the Pennsylvania State and Local Warning Systems

5.5.3.1 Description of the Pennsylvania State and Local Warning Systems

The Pennsylvania State Warning System is most unusual in that the counties are not drops off of NAWAS. Instead the NAWAS warning message is received at the primary civil defense state warning point in Harrisburg and the warning is then relayed to all counties by a state CD teletype network. From there the warning is relayed via telephone and radio to political subdivisions. Figure 5-14 shows the NAWAS state terminations. These include the CD warning points for the state and for Philadelphia, as well as several NWS locations. Additionally, there are drops at many state police facilities that are not part of the primary warning dissemination and are to be removed from the circuit.

Pennsylvania has 67 counties that are linked by the state CD teletype network known as the Council Teletype System. When a warning message is received at the state warning point in Harrisburg, an appropriate precut tape is selected and the warning message is broadcast to all 67 county warning points. The Council Teletype System is a 75 WPM network. Thus, a typical warning message could be selected, sent, and hard copy received within 2 minutes. The system provides for audible alerting to notify the receiving activity that an emergency action message has arrived.

The county agent then must relay the warning to the proper people/activities. This is done by activating alarms, and by radio and telephone fan out including notification to broadcasting facilities. The number of fan out actions required varies widely and constitutes a weak point in the system. Four examples are shown below. A table depicting actions for all Pennsylvania counties is included in Appendix E. The fan out examples are:

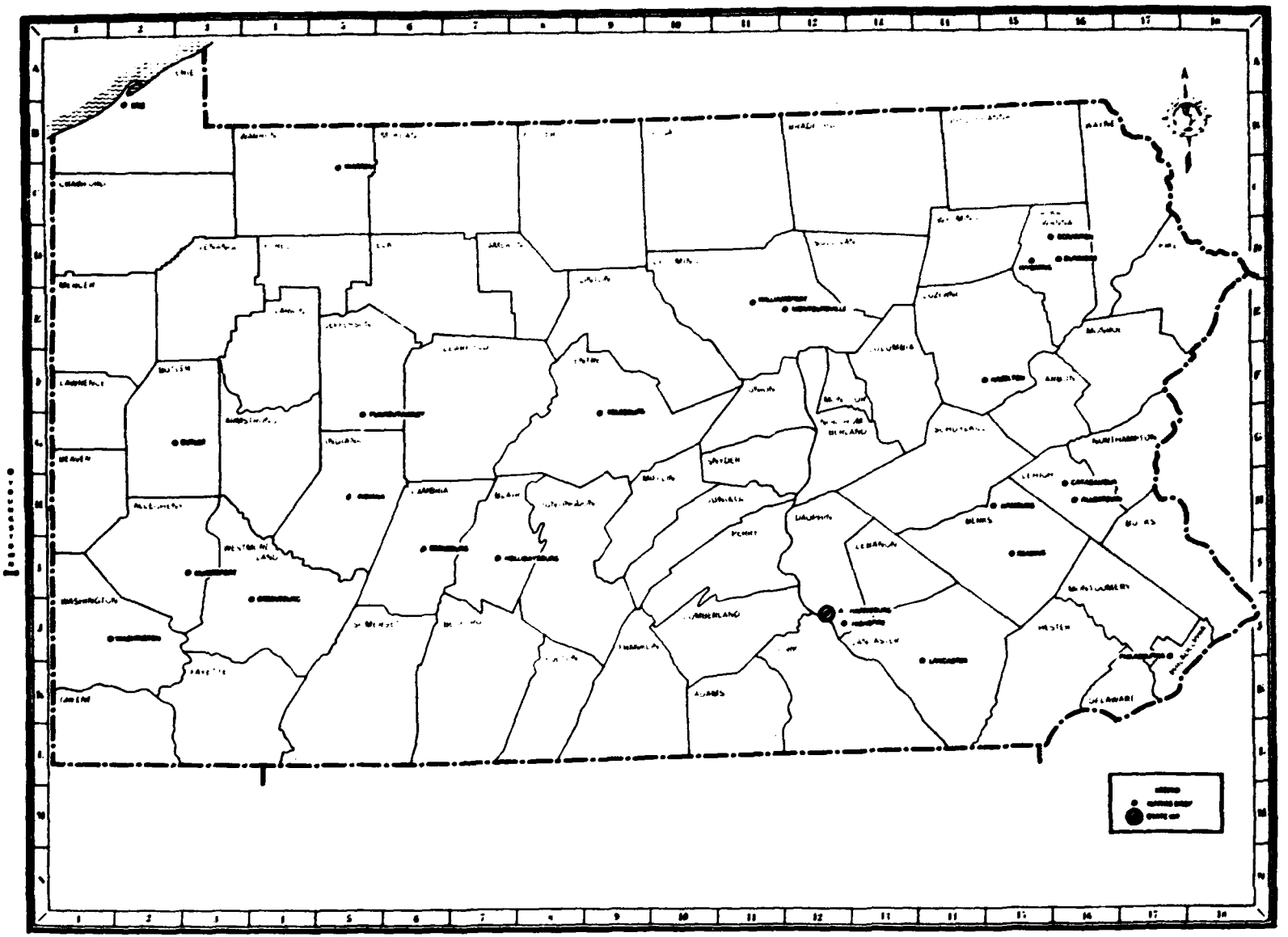


Figure 5-14. Pennsylvania NAWAS State Terminations

1. Delaware County - Radio to 49 local points

2. Cumberland County - Telephone to seven control points, which in turn, relay via fire radio to 12 boroughs and 22 townships, and to station WHVL

3. Luzerne County - Telephone to 74 political subdivisions and to stations WILK and WAZL

4. Centre County - Telephone to 10 boroughs and eight townships.

The time required for activation of the Centre County system during an earlier test took 68 minutes.

Table 5-11 summarizes the data relative to maximum numbers of personnel that would be alerted by the warning system. Figure 5-15 is a graphical display of the warning cycle events, based on the data of Table 5-11.

Figure 5-16 shows a schematic layout of the state warning circuit. This circuit primarily links state police offices rather than county CD offices. The NWS Weather Bureau offices are also on the circuit. It should be noted that this circuit (GP-4285-008) has a series (linear) configuration rather than the star configuration of the Maryland circuit.

At first glance the star (hub) configuration of the Maryland NAWAS circuit may appear more vulnerable due to its dependence upon the hub in the Baltimore high risk area. Actually, the Pennsylvania linear circuit has a similar problem in that the loss of the Harrisburg facility (located in a high risk area) would eliminate the entry point into the circuit and the NWC warning would not be received at any of the Pennsylvania NAWAS drops.

An additional and very significant point identified during the assessment of the state circuits is clearly illustrated by Pennsylvania Circuit GP-4285-008. Figure 5-17 shows the circuit configuration based on data from the DCA data base. The circuit configurations show unnecessarily long extensions. For example, Allentown is shown hubbed off of Erie rather than Catasauqua and Scranton is hubbed

Table 5-11. Pennsylvania Population Coverage by Outdoor Alarms (1 of 2)

	POPULATION	1ST LEVEL	2ND LEVEL	3RD LEVEL	4TH LEVEL	5TH LEVEL	6TH LEVEL	7TH LEVEL	PERCENT OF POPULATION COVERAGE / NUMBER OF SIRENS
ADAMS	59,600	4,000	4,000	4,000	4,000				26/29
ALLEGHENY	1,559,880	584,955	97,492	97,492	97,492	97,492	97,492	97,492	75 ESTIMATE/230
ARMSTRONG	77,200	32,166	6,433	6,433	6,433	6,433			75 ESTIMATE/28
BEAVER	212,600	159,450							75 ASSUMED
BEDFORD	43,300	2,706	2,706	2,706	2,706				25/21
BERKS	304,800	184,087	22,313	22,313	22,313	22,313	22,313		97/106
BLAIR	137,400	51,525	17,175	17,175	17,175				75 ESTIMATE/86
BRADFORD	59,200	44,400							75 ASSUMED
BUCKS	442,200		117,920	117,920	117,920				80/48
BUTLER	135,700	51,651	8,608	8,608	8,608	8,608			63/49
CAMBRIA	190,900	143,175							75 ASSUMED
CAMERON	7,200	1,333	1,333	1,333					56/5
CARBON	51,700	38,775							75 ASSUMED
CENTRE	103,800	12,110	12,110	12,110	12,110	12,110	12,110		70/35
CHESTER	286,600	49,848	21,556	21,556	21,556	21,556	21,556		55/41
CLARION	40,800	4,800							10 ESTIMATE/1
CLEARFIELD	76,900	32,298							42/37
CLINTON	38,400	17,553	4,388	4,388	4,388				80/18
COLUMBIA	57,400	25,112	3,683	3,683	3,683				63/24
CRAWFORD	84,900	63,675							75 ASSUMED
CUMBERLAND	166,800	22,796	22,796	22,796	22,796	22,796	22,796		82/58
DAUPHIN	226,700	105,133	5,734	5,734	5,734				57/59
DELAWARE	601,600	469,248							78/23
ELK	38,800	29,100							75 ASSUMED
ERIE	273,400	77,463	77,463	77,463					85/49
FAYETTE	157,000	117,750							75 ASSUMED
FOREST	5,000	425	425	425	425				34/3
FRANKLIN	102,000	66,300							65/32
FULTON	11,200	2,800							25/3
GREENE	38,300	8,229	1,452	1,452	1,452				32/19
HUNTINGDON	40,800	30,600							75 ASSUMED
INDIANA	83,900	62,925							75 ASSUMED
JEFFERSON	45,100	19,949	4,032	4,032	4,032	4,032			80/20
JUNIATA	17,800	13,350							75 ASSUMED
LACKAWANNA	237,000	4,879							2/3
LANCASTER	334,400	250,800							75 ASSUMED
LAWRENCE	108,600	43,440	43,440						80/31

Table 5-11. Pennsylvania Population Coverage by Outdoor Alarms (2 of 2)

LOCALITY	POPULATION	1ST LEVEL	2ND LEVEL	3RD LEVEL	4TH LEVEL	5TH LEVEL	6TH LEVEL	7TH LEVEL	PERCENT OF POPULATION COVERAGE / NUMBER OF SIRENS
LEBANON	103,500	40,365							39/39
LEHIGH	259,700	194,775							75 ASSUMED
LUZERNE	346,800	39,634	39,634	39,634	39,634	39,634	39,634	39,634	80/109
LYCOMING	115,700	86,775							75 ASSUMED
MCKEAN	52,500	27,442	4,390	4,390					89/30
MERCER	129,000	96,750							75 ASSUMED
MIFFLIN	46,100	34,575							75 ASSUMED
MONROE	49,300	38,426	3,809						85/38
MONTGOMERY	628,500	164,195	250,615						66/151
MONTOUR	17,800	12,460							70/8
NORTHAMPTON	221 300	165,975							75 ASSUMED
NORTHUMBERLAND	100,100	12,474	4,512	4,512	4,512	4,512	4,512		35/39
PERRY	32,200	14,490							45/12
PHILADELPHIA	1,881,300	1,410,975							75 ASSUMED
PIKE	12,900	9,675							75 ASSUMED
POTTER	17,500	1,555	1,555	1,555	1,555	1,555			44/15
SCHUYLKILL	161,900	19,659	19,659	19,659	19,659	19,659	19,659	19,659	85/?
SNYDER	31,100	3,887	3,887	3,887	3,887				50/15
SOMERSET	78,400	30,053	6,533	6,533	6,533	6,533	6,533		80/80
SULLIVAN	6,000	1,333	1,333	1,333					66/7
SUSQUEHANNA	36,900	27,675							75 ASSUMED
TIOGA	41,800	9,028	1,922	1,922	1,922	1,922			40/20
UNION	29,500	4,425	4,425	4,425	4,425				60/9
VENANGO	63,200	47,400							75 ASSUMED
WARREN	49,200	27,053	2,864	2,864	2,864				72/22
WASHINGTON	215,100	83,766	7,150	7,150	7,150	7,150			52/103
WAYNE	32,600	1,630	1,630	1,630	1,630	1,630	1,630		30/38
WESTMORELAND	379,300	284,475							75 ASSUMED
WYOMING	21,000	15,750							95 ASSUMED
YORK	282,000	239,700							85/70
TOTAL	11,902,000	5,975,181	828,977	531,113	447,927	282,132	252,432	156,785	
			6,804,158	7,335,271	7,783,198	8,065,330	8,317,762	8,474,547	
		50.2%	57.1%	61.6%	65.3%	67.7%	69.8%	71.2%	

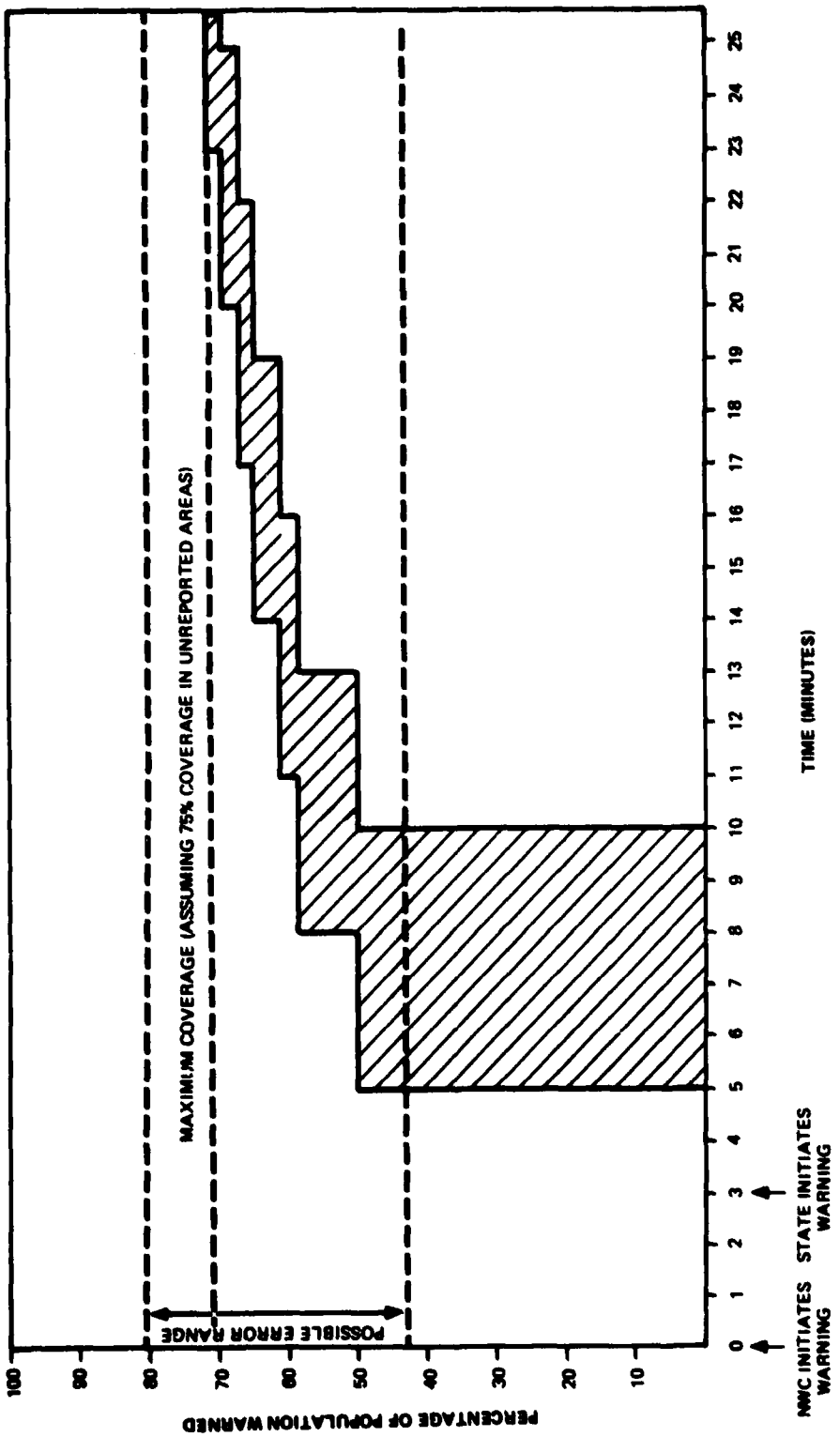


Figure 5-15. Pennsylvania Population Warning Times

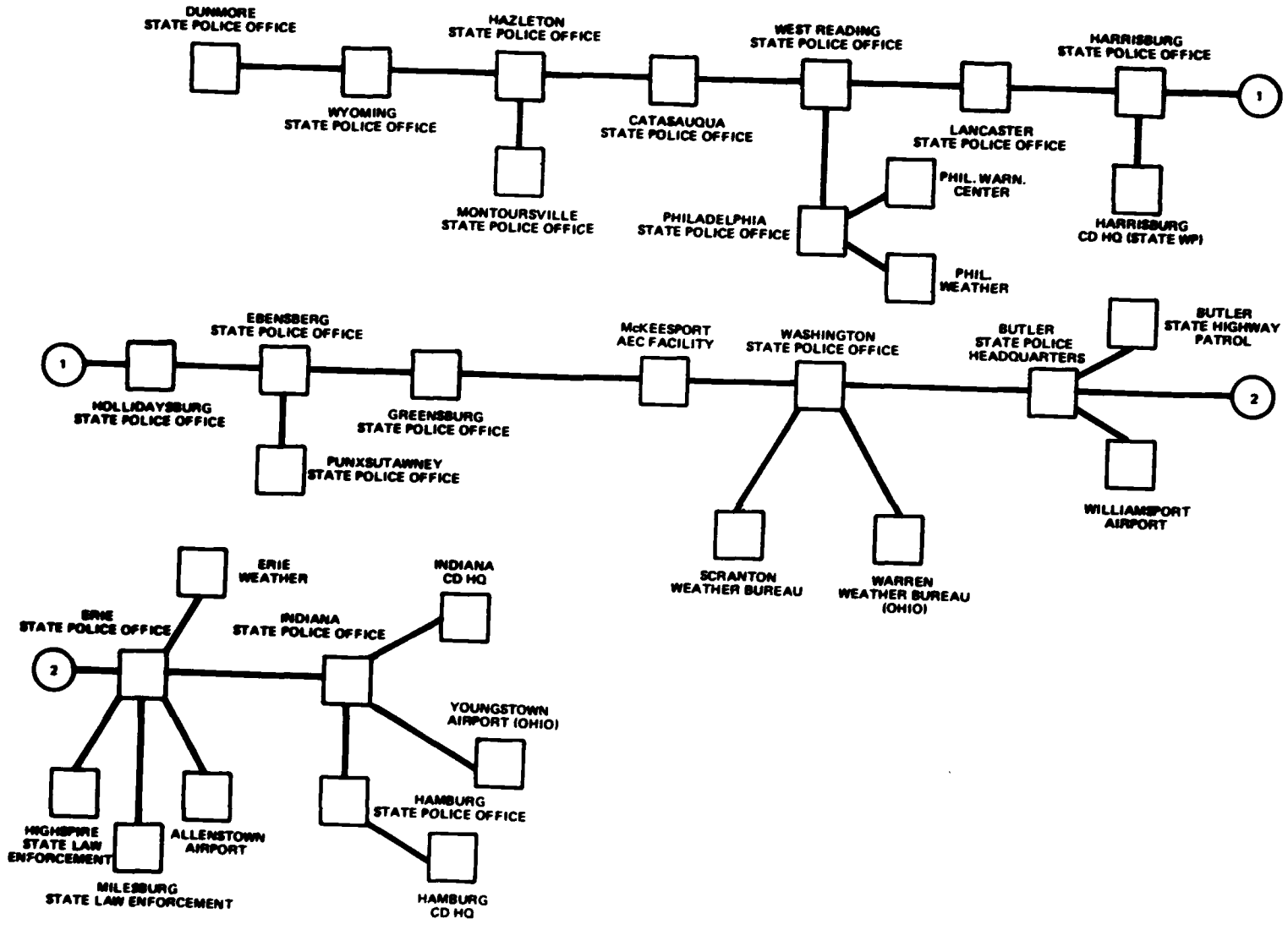


Figure 5-16. Pennsylvania NAWAS Warning Circuit GP-4285-008

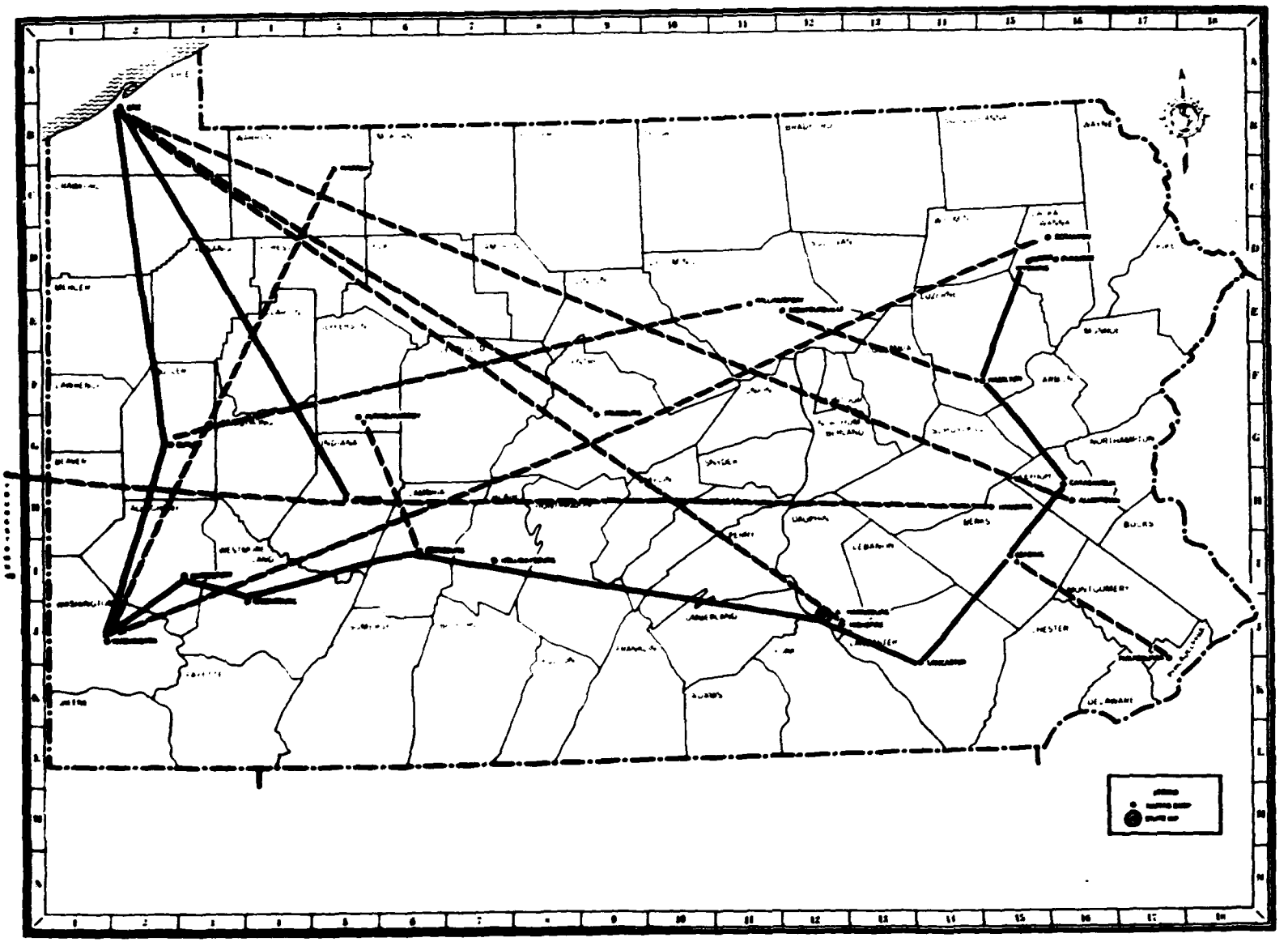


Figure 5-17. Pennsylvania NAWAS State Extensions

off of Washington rather than Dunmore. In both cases, the extensions are approximately 250 miles rather than 10 miles or less. This, if true, is highly undesirable from both a cost and a performance/survivability viewpoint.

A meeting was held with AT&T and DCPA representatives to clarify this matter but the data available at that meeting did not provide sufficient detail to resolve the question. The billing data simply showed termination charges and mileage charges for non-TELPAK segments.

The problem may be that the DCA data base has incorrect data. However, if the circuit is actually configured as shown, it should be reconfigured to save money and improve the performance/survivability. DCPA has requested that AT&T provide circuit routing data to assist in resolving the question.

5.6 STATE AND LOCAL WARNING SYSTEMS SUMMARY

This paragraph provides summarized data relative to the status of state and local warning plans and capabilities. It is based on data obtained on visits to Region 2 and Region 6, data available in the DCPA data base, and in the PSR.

The data presented in this report, unless otherwise noted, apply to the 48 contiguous states, Alaska, and the District of Columbia. These 50 entities will be referred to as the "states."

5.6.1 Status of State Warning Plans and Capabilities

All states report having completed warning plans. The fact that the states report this regularly does not ensure that these plans are current or adequate. Plans should be reviewed by regional or state warning personnel.

All states have the capability to receive an attack warning within 2 minutes. Additionally, each state has the capability to receive weather warnings.

The NAWAS attack warning system has a secondary mission of supporting natural disaster warnings. Such use of the system further justifies the requirement for the system and also tends to ensure that the personnel and equipment can perform in emergencies, as required. In this regard, during the first 9 months of 1977, the

warning system was activated 622 times for emergencies. Table 5-12 gives the breakdown by region.

Table 5-12. Warning System Emergency Activation

REGION	NUMBER OF TIMES SYSTEM ACTIVATED FOR EMERGENCY
1	39
2	25
3	76
4	31
5	86
6	365
7	0
8	0
TOTAL	622

As is shown in Table 5-12, emergency utilization varied widely by region. Within the regions the states also varied widely with 19 states not activiating the system for any emergency and Iowa activating the system 317 times. The emergencies are primarily weather related and the wide variation in use of NAWAS may be attributed to several things including (1) the variations in hazardous weather conditions, (2) availability of alternative communications nets for in-state warning, and (3) variations in program status reporting habits.

5.6.2 Emergency Operations Centers (EOC)

There is a growing trend for states and local communities to establish well equipped and protected EOCs. Such facilities are excellent locations for support of

warning activities. Many EOCs are operated 24 hours a day by highly-qualified personnel who are engaged in the direction and control of emergency-related operations such as police, fire, and emergency rescue type operations. They work with the media and have alternate communications facilities that could complement and back up the primary warning network. All states except Michigan and Vermont have at least one EOC. There are a total of 155 EOCs reported in the September 1977 PSR.

SECTION 6 - CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL

This section summarizes conclusions and recommendations based on data gathered and analyzed during the study and presented earlier. The present warning system is basically a system designed 25 years ago with the technology of that period. It is limited in its capability to perform its primary function, particularly with regard to warning the lower levels of government and the general public. It is also very susceptible to enemy action, having very limited survivability.

The backbone warning system, NAWAS, has proven very reliable in meeting its peacetime test and natural disaster warning support requirements. The state and local networks are not as effective.

6.1.1 Backbone System

The existing backbone system has the following favorable characteristics:

1. It is an in-place, operational system that links over 2,300 key Federal, state, and local offices. It has consistently provided highly reliable, quality voice circuits for many years with little line trouble. These circuits are provided by the Bell System, which has an excellent alternate routing capability between major network nodes
2. The Bell System has operations and maintenance personnel on duty 24 hours a day, available to accomplish circuit restoral or rerouting in the event of a system or circuit failure
3. The Bell System has many hardened switching centers and cable routes with blast, EMP, and fallout protection.

Despite these important favorable characteristics, the backbone system has significant weaknesses. These are:

1. While the backbone system is satisfactory and reliable for a peacetime (prestrike) environment, it is highly vulnerable to enemy action. As discussed in Paragraph 4.4, the present system does not provide a survivable warning capability. The loss of a few key circuits or nodes would prevent the dissemination of the warning message to very large number of activities further down the warning chain. Most state primary warning points are physically located in relatively protected structures; however, they are normally geographically located in high risk areas and their warning circuits go through nonhardened telephone facilities located in these high risk areas, both coming in from the region and going out to the counties

2. The NAWAS backbone system ties together an unusally large number of locations on one network. However, there is a greater number of state and local government and commercial activities that would be concerned with early warning of nuclear attack, but are not on the backbone system and are dependent upon the slower, less reliable fan out system to get warning notification. These cannot be added because the NAWAS system, as noted earlier, is near the realistic limit for a reliable, quality, multidrop network

3. The backbone system is not currently designed to accommodate crisis relocation sites

4. The system does not provide hard copy messages. A voice circuit is particularly desirable for a warning network to provide the message recipients an immediate and clear impression of the danger involved. However, it would be advantageous to have hard copy provide for confirmation, authentication (reduce chance of spoofing), and for passing on an accurate reproduction of the message to fan out points, other related activities, and for the record. This is particularly true for relay warning messages containing instructions on fallout data.

6.1.2 State and Local Systems

The state and local warning systems are the weakest part of the national warning system. Under peacetime (prestrike) conditions the warning would reach the state and local NAWAS drops in a rapid, reliable manner. Below this level the overall system alerting capability varies from good to nonexistent. The greatest weakness is the lack of a positive means of alerting the general public 24 hours a day. Specific aspects, good and bad, are discussed below.

6.1.2.1 Warning Points

Many states and counties have or are developing a set of excellent control centers for their ambulance, fire, police, and all other types of emergency rescue services. These facilities are staffed 24 hours a day with personnel who are trained and skilled in reacting to and coping with emergency related situations. These facilities are frequently in EOCs or other protected structures. They are generally equipped with excellent communications facilities; thus, they make excellent warning, dispatch, and control points.

Two problems that can seriously degrade the utilization of such facilities for the attack warning mission are as follows:

1. The personnel are routinely busy with actual current emergency situations and their attention or interest in the testing of a system for use in the unlikely event of a nuclear attack is small. Thus, they tend not to be concerned with actions they should take in event of a nuclear attack. This is evidenced by the occasional slowness in responding to daily NAWAS tests due to being fully occupied dispatching a fire truck or other emergency vehicle

2. Frequently there is very limited or no suitable means of directly alerting the general public. A case in point is Adams County, Colorado, which has an excellent EOC but only two sirens to alert the county population of approximately 60,000 people

3. Many counties and most state and local agencies and public or private institutions, such as hospitals, prisons, and schools are not in the NAWAS or on primary state warning circuits. Thus, they are dependent upon a fan out procedure, on outdoor warning alarms, or on EBS for the relay of a warning message.

6.1.2.2 Authority

As noted throughout the study, time is an essential evaluation criterion. Some local plans, such as the one for Colorado Springs, require the agent on duty receiving the warning to locate and contact the Civil Defense Director (in other cases the Mayor or other local official) for authority to initiate the warning procedures. This obviously introduces delay in a warning system that is already very time limited. In the case of Colorado Springs, if the CD Director cannot be located within 3 minutes the agent on duty may activate the warning system on his own authority. With a system whereby the Federal government accepted the responsibility for warning the general public directly, there would be only the decision at the highest level to initiate the national system thus eliminating decision-related delays farther down on the warning chain.

6.1.2.3 Fan Out Techniques

There are various techniques used for relaying the warning messages to points beyond the drops in NAWAS. The better techniques are all-points radio broadcast and hotline or prearranged telephone conference calls. The all-points radio broadcast permits passing the warning simultaneously to many local or distant points equipped with radios.

Similarly, simply by picking up the handset (or dialing a prearranged code) a conference call can be immediately established with selected points designated to get the warning message. Radio and TV stations as well as local government offices are regularly on such conference call configurations.

Other fan out plans are much less satisfactory. These call for the agent on duty to pass the warning by calling a series of people in turn. In many cases, only one or

two other counties or points within the agent on duty's own city or county have to be called. However, in other cases, the list of calls to be made has exceeded 70 calls. A specific example cited earlier, for a Maryland fan out having taken 68 minutes, indicates the unsuitability of this procedure. The time for a telephone fan out can be cut down greatly by having each person called responsible for calling one or more additional personnel on a prearranged list, but such schemes quickly break down when personnel cannot be reached or do not have their calling list and numbers immediately available. Further, in major emergencies, telephone systems can get overloaded quickly. If line load control procedures are put into effect, people may not be able to get a dial tone to call out from their telephones.

6.1.2.4 Outdoor Warning Systems

The primary government controlled means of warning the general public is by activating outdoor warning systems. This study has used data based on siren coverage areas to develop population coverage estimates. As noted previously, estimates based on such coverage figures are high since most people in the coverage area are normally not outside to hear the siren. Instead they may be in their insulated homes or offices with double or storm windows and in a high noise environment with air conditioners running. Many people outside are in cars with the windows closed and a tape deck playing and will not be able to hear the siren. This is not to say that sirens should not be part of a warning system but rather it is to point out their major limitations and to warn of the fallacy of assuming that all personnel within the calculated warning coverage area actually would be warned by the sounding of the siren.

6.2 RECOMMENDATIONS

During the analysis, various ideas and potential solutions to problems associated with the warning system were noted. These are presented in the form of recommendations in the following paragraphs.

6.2.1 Policy

6.2.1.1 Trans/Post Strike Mission

1. Problems

   a. Clarification is required on whether the attack warning system is required after the initial attack

   b. Clarification is required on Federal responsibility and policy concerning disseminating warning directly to the general public.

2. Recommendation

   A DCPA (FEMA) policy should be promulgated stating the need for the warning system to continue to be operational during and post strike. This could be accomplished by revising DCPA Policy Paper 5-1-0-0-1, "Alerting and Warning Program Basic Policy" to read similar to the following:

   a. It is the policy of DCPA (FEMA) to develop and maintain a capability to provide warning of impending or actual enemy attack upon the United States. This is a continuing requirement that covers prestrike, trans-strike and post-strike time frames and includes dissemination of warning information relative to incoming missiles, enemy aircraft, target areas, fallout danger, secondary or follow-on attacks, or other pertinent warning-related data

   b. A primary objective of the Federal warning system is to disseminate the warning information directly to Federal military and civilian authorities, state and local authorities, and to the civilian population

   c. DCPA (FEMA) will encourage and support state and local authorities in supplementing the national warning system in

disseminating warning to activities and personnel in their jurisdiction

d. The above-stated policies will be reflected in appropriate warning-related plans, procedures, and system designs.

6.2.2 Requirements

It is recommended that DCPA (FEMA) establish a clearly definitized warning system requirements statement. Such an approved guideline is an essential management tool for system planners and designers in developing a satisfactory system. It is also important to upper management for accurately evaluating the organizational capability to accomplish its broadly stated warning mission.

The proposed Integrated Warning System (IWS) requirements listed in Paragraph 2.7.2 are an excellent base. These requirements should be reviewed and amended as required to accommodate any new or changed missions or functions relating to the new FEMA organization.

In addition, the following suggested changes to the IWS requirements should be considered.

1. Coverage. The primary warning system shall provide an intelligible voice message to system receivers located within the 48 contiguous states and the District of Columbia. The primary warning system must be capable of interfacing with the local warning systems in all states, the District of Columbia, and U.S. territories and possessions. The intelligible voice message shall be available to:

   a. All desigated Federal, state, and local offices

   b. 99 percent of all CONUS broadcast stations

   c. 90 percent of the population residing on 95 percent of the CONUS land area.

2. Continuous Activation Capability. The primary warning system shall be capable of being activated at any hour of the day, any day of the year. There must be a 24-hour capability to transmit an alert or warning message through each warning receiver, with at least 90 percent probability of receiving an understandable message the first time it is transmitted. The warning system receivers shall be of such a design that they may be demuted

3. No Change

4. No Change

5. National Initiation Points. The system shall be capable of activation on a nationwide basis from either of the two primary DCPA NWCs or on a back-up basis from any of the eight regional centers except Region 2

6. No Change

7. Message Types. The primary warning system shall be capable of transmitting voice messages. Additionally, hard copy should be provided to designated Federal, state, and local activities

8. No Change

9. No Change

10. No Change

11. No Change

12. Verification of Activation and Operational Status. Verification of the performance of the transmitting elements of the system shall be given to the Federal official at each primary national initiation point and at each regional center (except Region 2). The operational status of the system--the test or attack warning actions taken at either of the two primary national initiation points or seven regional activation points--shall be displayed at all other initiation points

13. No Change

14. No Change

15. Warning System Receiver Requirements. The system shall operate with warning receivers that may be demuted by coded signal from a warning system transmitter. The warning receiver shall operate and be capable of furnishing an alerting signal and an intelligible message following appropriate receipt of the appropriate coded turn-on signals. Government procured receivers must operate with not less than a 99.9 percent reliability and must be capable of operating for at least 48 hours with a 25 percent audio on, duty cycle in the absence of commercial power. Privately procured or government receiving units may be separate units or an addition to a unit primarily serving another purpose such as a TV or conventional radio set

16. No Change

17. No Change

18. No Change

19. No Change

20. No Change.

6.2.3 Warning System

The Nation needs a warning system that is survivable, provides warning directly from a Federally controlled system to the general public, and is flexible enough to be compatible with crisis relocation planning. Such a system should be designed using the currently available modern technology. This is a long-term design and implementation effort and the existing system should be upgraded to provide better capability in the interim period. Recommendations on these two suggested programs follow.

6.2.3.1 Long-Term Redesign

It is recommended that a complete design study be made to develop an integrated, survivable warning system. The system should be based on an approved version of the IWS requirements.

The system should provide alerting and warning directly to all desired Federal, state, and local agencies, major public and commercial activities, and the general public. Among the items that should be considered in regard to the system are:

1. Use of satellite communications
2. Use of a mobile low frequency network
3. Use of meteor burst communications for LF network control
4. Utilization of the automated switching capability of AUTOVON for key terrestrial circuits
5. Real-time monitoring and display of status of critical data at key warning centers
6. Automatic circuit/system trouble detection and reroute/restoral
7. Automated activation of NOAA Weather Radio Service for rebroadcast of warning message
8. Adequate system security to prevent spoofing or accidental system activation
9. Addition of an automated data network to provide hard copy for key warning centers. NLETS, AUTODIN, or similar networks should be evaluated as possible shared systems.

6.2.3.2 Interim Integrated Warning System

The weaknesses of the existing system can be, in part, corrected by the following recommended actions.

1. Each of the two NWCs should have positive and automatic control over each regional center's state warning circuits.

2. Alternate routing of the control and regional warning circuits should be established, with the cooperation of AT&T, so that dual and widely dispersed routes are available to link the NWCs with each other and to link the ANWC with NORAD and ALCOP

3. Investigate the utilization of AUTOVON trunking to provide survivable links between key NAWAS centers

4. Evaluate each state network from a technical and economic viewpoint to improve survivability and perhaps reduce costs. A closed loop configuration with more than one state entry point, separated by at least 50 miles from the primary entry point, would increase survivability. At least one entry point should not be in a high risk target area. This evaluation will require getting detailed routing information from AT&T. The costing can be particularly important as the current TELPAK low-cost tariffs are scheduled to be discontinued. If this occurs, major circuit redesign may be appropriate from a cost viewpoint as the current pricing configuration is designed to take advantage of available TELPAK channels

5. Coordinate with NLETS to have the national warning message released by the NWC to the NLETS computer for automated dissemination over all state networks tied into NLETS. Additional CD drops could be added to state networks as required

6. Utilization should be made of existing governmental (Federal and state) teletype networks such as AUTODIN, ARS, CCIC, and others to provide wider dissemination of the warning message

7. The number of households that can be alerted by demutable home receivers is continually increasing due to sales of weather broadcast receivers. Action should be taken to ensure that existing NOAA Weather Radio stations that are not presently in NAWAS, and all new ones, are included in the NAWAS network.

8. Establish a program to support state and local officials in the completing/updating of state and local warning plans. Topics to be addressed in this effort include the following:

   a. Impact of crisis relocation planning

   b. Finalizing written operational agreements with area radio and TV station management

   c. Inclusion of NOAA Weather Service in warning dissemination

   d. Provision for maximum use of available state and local networks for primary or back-up warning dissemination capability

   e. Appropriate use of dedicated and conference circuits for support of fan out procedures

   f. Coordination of prearranged design and implementation plans for telephone or other communications services that may be required upon short notice in support of crisis relocation plans or other emergency situations.

6.3 RELATED AREAS

6.3.1 Motivation/Education

A major problem affecting the warning system program is the mental attitude of people regarding a nuclear attack. A common and natural reaction to the idea of a nuclear attack is twofold:

1. It is not likely to happen; therefore do not waste time and money in preparing for such an unlikely event

2. If it did occur the situation is hopeless and there is nothing one could do.

Recent publicity concerning CRP has resulted in considerable initial unfavorable comments due to the obvious difficulties in relocating personnel, particularly those living in large high risk metropolitan areas where the traffic problems would be so great.

Education and selling of the public and Federal, state, and local government officials are needed to increase their understanding and obtain their support for the civil defense effort. The publicizing of Russia's progress and capability in this area and the potential life saving of such plans, if properly presented, with Presidential and congressional level support, could assist in developing needed support for CD programs and systems.

6.3.2 Federal Assistance to State and Local Offices

An additional problem, similar to the mental attitude problem discussed above, is that of the amount of attention given to the CD warning system. Personnel whose sole job is related to the warning system appear well qualified and informed. However, persons who have warning systems duties as a part-time or secondary function are frequently and easily diverted from giving attention to a warning system that functions well during peacetime tests to other more immediate tasks which require their time and effort.

To produce an effective warning program, Federal assistance is needed in providing supervision, guidance, and monetary support of state and local programs.

As evidenced by the lack of plans in many counties, incomplete or outdated plans in others, and the lack of state manpower to monitor and assist local areas in developing and maintaining adequate plans, Federal assistance is required. This could be accomplished by Federal employees or by Federal assistance for the hiring of state employees or contract personnel.

Further, Federal support for procurement of equipment such as sirens for area coverage and demutable warning receivers for government offices and public and private institutions, such as schools and hospitals, would improve the Nation's warning capability.

APPENDIX A - CRISIS RELOCATION WARNING PLAN GUIDE

APPENDIX A - CRISIS RELOCATION WARNING PLAN GUIDE

A.1 PURPOSE

The purpose of this planning guide is to describe a methodology for upgrading the Federal, state, and local warning systems in order to support a crisis relocation effort.

A.2 BACKGROUND

Despite the magnitude of the holocaust that would be caused by a full scale nuclear attack on the United States, much could be done to limit the death toll by a simple concept of dispersion. Studies have shown that casualty figures could be reduced from about 60-80 percent to 20-30 percent under a full attack if the personnel in the major cities and target locations were spread out over the less densely populated areas. The main danger in those areas would be fallout and relatively simple precautions can provide protection from fallout.

The USSR has an effective plan for dispersing their civilian population by relocation to less densely populated areas and their citizens take required civil defense training.

The central ideas behind the crisis relocation concept are:

1. There will be a period of buildup of international tension, and during this period the President may decide to execute crisis relocation plans. It is expected that there would be at least 3 days to execute the relocation moves
2. The country has designated risk areas (likely target areas) and host areas. The host areas would provide facilities to house the relocatees from the risk area
3. Personnel relocated to host areas will not be living in the field but will be primarily housed in buildings such as schools, auditoriums, and other existing structures

4. The number of personnel relocated to a host area will, in general, be two to three times the number normally living in the area. Thus, the host area will be crowded but not totally "swamped."

5. An adequate warning system is required to cover the greater concentration of personnel in the host area

6. The risk area, although largely evacuated, will still house personnel commuting into the area to provide vital services such as O & M of railroads, fire, and law and order functions, vital commercial and industrial activities, and communications, broadcast, and media functions. Additionally, there may be some personnel who will refuse to abandon their homes. The impact of this is that the warning system must continue to function in the risk area as well as in the host area.

The status of the CRP program is that it is in its very early planning stages. Colorado is being used as a trial state and initial plans for Colorado are presently being prepared. Warning system planning will be included in all relocation planning.

A.3 CONCEPTUAL GUIDANCE FOR CRISIS RELOCATION WARNING PLAN

Federal, state, and local governments all have a significant role in developing an adequate warning system.

The Federal government has the responsibility of providing a warning system that will warn key Federal, state, and local officials and the general public. The existing backbone system, NAWAS, does an excellent peacetime job of getting the warning to the over 2300 points on its network; however, it has two major weaknesses. They are:

1. It reaches the public only through dependence upon other systems that presently have pnly a limited capability to alert the public

2. The system is very vulnerable to enemy attack.

Greatly improved capability to reach the public in their homes can be developed by use of demutable home receivers that can receive an alerting signal and a warning message. This same capability can be used to greatly increase the number of Federal, state, and local offices that could get the warning directly from the national system rather than by a slow fan out procedure. Greater use of the NWS Weather Radio could provide such an interim capability.

The second item, survivability, addresses a most difficult area. Any nationwide system, which is made survivable by hardening of structures and facilities to withstand direct nuclear weapons attacks, is very expensive and usually impractical. Survivability can best be obtained by dispersion and redundancy of facilities and systems. These two characteristics are not easy to meet as it is the concentrated areas that need the warning and are also the logical targets. Redundancy is expensive and hard to justify, particularly in peacetime. However, a survivable warning system is essential.

The state and particularly the local governments are essential in the crisis relocation planning because they will be most directly concerned. Hence, they should be involved in the detailed planning and must be involved in crisis relocation implementation. It is the state and local governments that can provide additional survivability to warning systems in an economical manner by including state and local microwave, radio, teletype, and other communications networks in plans to back-up the Federal warning system. Local radio and TV stations can greatly assist in getting the warning to their audiences.

Among the major roles of the state warning officials are the following:

1. Ensure that all essential state and local activities are covered by the warning systems
2. Ensure that state and local warning plans are complete and current
3. Assist in coordination between host and risk area planning personnel
4. Ensure that maximum use is made of available communications and media facilities to supplement and back up the warning system

5. Provide planning and technical assistance to local governments in meeting their warning system responsibilities.

Major responsibilities of the local government include the following:

1. Ensure that local plans are complete and current, and that the state has current copies

2. Ensure that properly qualified and trained personnel are available to receive, and pass on the warning message

3. Ensure that officials and the general public are aware of the warning system, its signals, and the actions they should take in the event of a warning

4. Ensure that maximum use is made of alternative back-up warning systems to assist in rapidly disseminating a warning message

5. Have detailed written plans coordinated with and signed by appropriate host or risk area authorities, telephone companies, broadcast station management, and other related government agencies to provide enlarged warning capability in support of crisis relocation.

A.4 IMPLEMENTATION METHODOLOGY

A significant effort is required to upgrade the warning system and provide a fully adequate system for warning under non-relocation or relocation conditions.

This paragraph addresses alternatives for accomplishing this vital task. Both relocation and non-relocation situations should be considered at the same time. The same basic system should cover both cases.

A.4.1 Backbone Warning System Upgrade

The Federal government at the national level should take the lead in upgrading the basic warning systems. Specific actions suggested in this area are listed below:

1. Publish policy statements that require:

   a. The Federal government system to reach the general public directly with attack warning messages

   b. The warning system to be survivable.

2. In order to reach the public directly, the Civil Defense warning system must have the capability to activate a home alarm system and deliver a warning message. Two courses of action are available in this regard. The first is to actively support at the Federal level, the integration of the NWS radio system into the attack warning network on a nationwide basis. Present national policy dictates that the only home warning unit is the one working with the VHF band NWS weather radio system. This system does not provide the ideal long term solution to the home warning problem, but it is the most feasible interim solution and should be supported at the national level as an interim solution. Many states are working closely with the NWS and actively integrate this capability into their emergency networks.

A permanent solution to the home warning problem is required. The solution may be an upgrade of the NWS VHF system or any of a number of other alternatives that may provide better results than can be obtained with the NWS system. Alternatives that should be evaluated include:

1. A mobile low frequency transmitter system that would have greater area coverage and be less apt to be bothered by EMP

2. A satellite system that would have the total nationwide coverage desired

3. A system employing standard home radio or TV receivers with a built-in additional unit that would permit demuting on receipt of a coded signal from selected radio stations operating in the MF or VHF band.

Actions that can be taken to improve the NWS systems include:

1. Obtain additional frequencies to permit the installation of additional NWS radio stations with fewer interference problems. The present limitation of three frequencies is restrictive and interference problems exist

2. Automate the retransmission of the warning message over the NWS radio system

3. Evaluate the feasibility of having keying lines from key state/county CD warning points to the NWS transmitter to be used in the event the NWS station is unable to operate the transmitter facility.

These and other similar considerations should be accomplished from the national level.

Likewise, FEMA should assume a leadership role in developing the interim and long term solution to the home warning problem and have a defined program adopted and funded so that the final system will be in operation by the early 1980s.

A.4.2 State and Local System Upgrade

In addition to improving the backbone system, much can be done to upgrade the state and local portion of the warning system. Success in this area requires the coordinated effort of local, state, and Federal personnel. The primary role that the Federal government can play is to support state and local efforts by providing leadership, information, guidance, training, personnel, and funding to develop, implement, and test warning systems, plans, and procedures. The Federal government's participation should not overdominate warning system planning and development to such an extent as to inhibit state and local involvement. Instead, the Federal government's leadership role, executed through the FEMA regions, should encourage state and local official participation, which is vital to successful upgrade of the warning system.

A major weakness in the state and local area is the lack of current, valid plans that have been tested down to the lowest level. Further, there are very few plans addressing crisis relocation.

There are alternative ways for the Federal government to improve this situation. Several are discussed below:

1. Prepare and distribute information packets containing sample warning plans that address crisis relocation planning, plan checklists, and names of regional contacts that can answer questions on plan preparation. States and regions should require a copy of the plans developed by lower jurisdictions and a report should be rendered every 6 months indicating that plans have been reviewed, and amended, if required. A copy of any amendment should be forwarded to state and regional headquarters.

2. A brief (2 or 3 day) course could be held by the region and state team for CD warning officers from each county/major jurisdiction. The course would cover CD, emphasizing warning aspects. A communications specialist should explain types of automatic conferencing arrangements available and procedures for coordinating preplanned orders that could be expedited in the event of an emergency. Typical agreements between radio/TV stations and CD offices could be explained and sample forms provided. Risk area and host area meetings could be held to coordinate warning related matters.

   Upon completion of the course, the local representatives would return to their respective areas and prepare/update warning plans including coverage under crisis relocation conditions and forward copies to state and region.

3. Action 2 could be amplified by having a state or regional team (or a contract sponsored team) visit each county in the state after the course. The visiting team would provide expertise in plan preparation and could conduct additional training for local personnel. They would assist in developing specific detailed communications plans for regular and crisis relocation warning systems, and conduct (or participate in) coordination

meetings with radio/TV station management, the telephone company, and other groups that can play a helpful role in developing, testing, and maintaining a viable warning system.

The national level staff should participate by monitoring the upgrade effort and advising regions and states of ideas, training methods, and test and evaluation procedures that were particularly successful in other areas.

APPENDIX B - COLORADO STATE CRISIS

RELOCATION PLAN

APPENDIX B - COLORADO STATE CRISIS RELOCATION PLAN

(Appendix 6 to Annex A, Executive Control)

B.1 PURPOSE

The purpose of this Appendix is to define the Colorado State attack warning system that will be utilized under crisis relocation conditions.

B.2 GENERAL BACKGROUND

Annex A, Section II of the Colorado State Crisis Relocation Basic Plan, assigns to the State Government Executive Control organization the preparatory stage responsibility to maintain a capability to provide attack warning before and during crisis relocation and for disseminating relocation advisories and orders. Additionally, the Executive Control organization has the responsibility to disseminate the attack warning throughout the state in the event of an impending or actual attack.

The State of Colorado has four risk areas whose population will relocate to less populated areas in the event crisis relocation plans are put into effect by direction of the Governor.

B.3 BASIC NATIONAL/STATE WARNING SYSTEM

Colorado has 36 drops on NAWAS. These include the primary state drop, located at the State Patrol office in Denver, the alternate state drop at the Camp George West EOC, 10 drops at State Police Patrol Headquarters, 5 drops at NWS offices, as well as drops at other Federal, state, and local offices.

The 45 counties not provided a NAWAS drop get their warning notifications by radio or telephone fan out from a NAWAS drop location, normally a state patrol headquarters.

The general public may receive the attack warning via outdoor warning sirens or other audible alarms, NWS radio, or if their set is already turned on by means of local radio or TV stations. The attack warning is a 3- to 5-minute warning tone. Upon hearing the attack warning signal, personnel should take the best available cover without delay, and where possible, turn on a local EBS station to get any

available detailed information on the warning situation. The best available shelter may be the basement of a house or building or just a stairwell.

A portable, battery-operated radio would provide an excellent way of obtaining additional data. The all-clear signal for termination of an alert warning will be announced on designated local radio and TV stations and by sounding 10-second blasts on the siren for 3 minutes.

B.4 CRISIS RELOCATION WARNING CONCEPT

To the maximum extent possible, the warning system under crisis relocation conditions will function the same as it does under nonrelocation conditions. This is realistic in that personnel evacuating risk areas are going to host areas that are established, but less heavily populated communities, that are also covered under a regular warning plan. Two significant aspects related to crisis relocation follow:

1. The host areas are normally equipped with less sophisticated systems and there is less commercial radio and TV and NWS weather radio coverage

2. Planning must provide for the situation in which the warning comes while relocation is underway and the highways are jammed by personnel relocating to a host area or passing through a host area enroute to another designated host area.

B.5 PREPARATORY ACTIONS

The Executive Council will take all necessary action to accomplish the following, relative to the development and implementation of Crisis Relocation Warning Plans.

1. Ensure that each risk area and host area (county or local subdivision) in Colorado has a plan that covers warning procedures under a crisis relocation situation. The plans should be current, i.e., reviewed/updated at least once every 6 months.

2. Monitor coordination between host areas and risk areas whose personnel will either transit the host area or be housed in it in the event of relocation. It is essential that personnel entering the host area be aware of the local alarm warning procedures and know the frequencies of emergency stations that will broadcast warning information.

3. Ensure that written agreements with radio and TV station management have been finalized at state and local levels. The agreements will provide for the necessary coordination and establishment of facilities and procedures for the relaying of warnings and warning-related information.

4. Assist host counties and other local jurisdictions in planning for and obtaining adequate warning facilities to cover their enlarged area of responsibility.

5. Ensure that adequate planning and prearranged circuit orders are coordinated with the appropriate telephone company to provide for dedicated and conference networks. These services will be installed within 8 hours after notification. Telephone service will be provided to support the personnel and activities moving in to the host area from the risk area. Additionally, dedicated circuits will be installed linking key offices of the host and risk areas to simplify coordination. Conference networks will be established to expedite dissemination of warning messages to the additional personnel and activities billeted in the host area.

6. Ensure that warning plans provide for adequate coverage of the risk area which would be largely but not totally evacuated. Due to relocation, personnel and activities that would have assisted in disseminating the warning to local or outlying regions may not be available to accomplish this task. For example, Pueblo, a risk area, normally relays the warning message to Fremont County, a host area. In the event crisis relocation has taken place, the Pueblo activity may no longer have personnel at its normal

warning point and thus, not be in a position to receive nor pass on the warning to Fremont County. Thus, dedicated circuits to the state EOC are desirable.

7. Coordinate closely with Civil Defense, NWS Federal and Regional, and state communications personnel to ensure that the maximum extent practical, future planning for NWS Weather Radio System area coverage will take into consideration the impact of crisis relocation on population distribution.

B.6 CRISIS RELOCATION ATTACK WARNING SYSTEMS

The requirement for sounding an attack warning can come in one of three time periods with regard to crisis relocation status, (1) before relocation has started, (2) while relocation is in progress, and (3) after relocation has been accomplished. All three situations will have similarities; that is, in each case, there will be people in the risk area, people in the host area, and people traveling on the highways. Each case is covered below.

1. Pre-relocation

   This is the normal condition and the warning would be disseminated in the standard manner, i.e., it would be received at the NAWAS drops and passed on through the established fan out procedures.

2. Relocation Accomplished

   In this situation, the host area has received the personnel relocated from the risk area. The warning will be received via NAWAS and disseminated using the normal fan out procedures and/or via new circuits and fan out procedures established to notify the relocated risk area personnel. In that these people will primarily be billeted in large communal groups, there will be little difficulty in maintaining a 24-hour watch to receive the warning via emergency radio, outdoor alarm, conference telephone, or other dissemination techniques.

3. Relocation in Progress

If the warning comes while relocation is in progress, attention will be ensured by the situation leading up to relocation implementation. With the large number of cars equipped with radios, there will be little difficulty in providing a speedy warning to this group from the radio stations covering the area.

It is most important that instructions be provided in advance to the relocating personnel so that they know the proper action to take in the event of a warning while in transit. Instructions should be repeated immediately following the warning announcement.

APPENDIX C - COLORADO SPRINGS

CRISIS RELOCATION WARNING PLAN

APPENDIX C - COLORADO SPRINGS CRISIS RELOCATION WARNING PLAN
(Appendix 9 to Annex A)

C.1 PURPOSE

The purpose of this Appendix is to define the warning system that will support the El Paso - Colorado Springs area in the event crisis relocation plans are implemented.

C.2 BACKGROUND

Colorado Springs and environs have been designated as a risk area. In the event the Governor of Colorado directs the activation of the state Crisis Relocation Plan, the personnel residing in the Colorado Springs area will relocate to the following host counties: Alamosa, Chaffee, Fremont, Gunnison, Saguache, Teller, and also to the rural eastern area of El Paso County.

There will not be a total evacuation of the Colorado Springs risk area as some people may refuse to leave. Additionally, there are many activities that are classified as necessary risk area operations and others as possible risk area operations. The people involved in these operations will be billeted in the adjacent host areas but will work shifts in Colorado Springs. The impact of these factors is that it is essential that Colorado Springs continue to have a warning system even after crisis relocation plans have been implemented.

The warning of personnel remaining in the Colorado Springs area remains a responsibility of the Colorado Springs - El Paso Civil Preparedness Organization which will have the necessary authority to accomplish its mission. When personnel have left the boundaries of El Paso County, they become the responsibility of the county they are transiting or in which they are being temporarily housed.

C.3 BASIC WARNING SYSTEM

Under a nonrelocation situation warning responsibilities will be met as described in the El Paso County - Colorado Springs emergency plan. The warning will come from

the NWC, Cheyenne Mountain, Colorado or the Alternate ANWC, Olney, Maryland via NAWAS. State circuit GP-8232-081 connects the state primary warning point at the state patrol headquarters in Denver and the alternative state warning point at the state EOC at Golden with 34 other points throughout the state.

These NAWAS drops include the following:

CD Directors Office	-	Colorado Springs, El Paso County
Fire Dispatch Center	-	Colorado Springs, El Paso County
National Weather Service Station	-	Colorado Springs, El Paso County
Sheriff's Office	-	Alamosa, Alamosa County
Sheriff's Office	-	Salida, Chaffee County

The other host counties supporting Colorado Springs get their warning notification as follows:

Fremont - notified by Pueblo State Patrol
Gunnison - notified by Chaffee County Sheriff's Office
Saguache - notified by Alamosa State Patrol
Teller - notified by El Paso Colorado Springs Fire Dept./EOC

In accordance with the present plan, the Colorado Springs Civil Defense Director will make the decision to activate the warning plan after receiving the warning message on the NAWAS circuit. In the event he cannot be contacted within 3 minutes the agent on duty may, on his own authority, activate the alarm system and the fan out procedures.

C.4 CRISIS RELOCATION CONCEPT

The basic concept for warning operations under crisis relocation conditions is to operate in the same manner as under the noncrisis relocation plan, to the maximum extent possible. This will simplify procedures and training, which is an important consideration in times of stress. The basic mission is the same in either case, i.e., to alert and warn, in the shortest possible time, the maximum number of personnel within the Colorado Springs - El Paso County area of an impending or actual attack.

However, there are differences from the nonrelocation situation that must be addressed by preparatory actions and revised plans.

C.5 PREPARATORY ACTIONS

The Colorado Springs - El Paso County Civil Preparedness Organization will take all necessary actions to accomplish the following, relative to the development and implementation of a crisis relocation plan.

1. Maintain close coordination with the state Civil Defense Office and comply with relevant directives and plans
2. Ensure that the crisis relocation warning plan is reviewed and updated a minimum of every 6 months
3. Establish and maintain close liaison with officials of each of the six host counties that will be supporting relocatees from Colorado Springs for the purpose of assisting in the development and maintenance of warning systems to be used under relocation conditions
4. Establish and maintain liaison with representatives of Park and Custer Counties to coordinate plans and the dissemination of relevant warning information to relocatees who may be transiting these counties en route to their designated host county
5. Prepare information and have available plans, procedures, and material for instruction on the warning procedures relocatees will encounter en route to and while at their host area
6. Have current written agreements and coordinated plans for the dissemination of warning messages via local radio and TV stations
7. Have plans prepared and coordinated with the telephone company for the rapid installation of new support circuits. This would provide for dedicated circuits to and from the Colorado Springs EOC to all related host counties, Park and Custer Counties, and to the host county billeting locations of

key Colorado Springs emergency personnel. Additional dedicated telephone service should be provided to activities that remain operational in the Colorado Springs area.

8. Provide an alerting and warning system for government activities and the general public who will be housed in the eastern El Paso County area.

C.6 CRISIS RELOCATION WARNING SYSTEMS

1. Pre-Relocation Scenario

If an attack warning is received prior to the start of relocation the established non-crisis relocation plan will be followed.

2. Relocation Scenario

If an attack warning is received after crisis relocation has started, the following warning procedures will be followed:

a. Upon receipt of a warning message the CD Director or his designated representative will be advised and he will determine if the warning system should be activated. If the CD Director or his representative cannot be located within 3 minutes the agent on duty will determine if the warning system should be activated.

b. If the decision is yes, then the following will be accomplished.

(1) The attack warning sirens will be activated

(2) The Teller County Sheriff's office will be advised

(3) Local conference calls and dedicated lines will be used to notify radio stations, TV stations, and other activities that remained operational in the area

(4) The agent on duty will verify that the NWS received the warning and is broadcasting the information

(5) The dedicated lines to the host areas including eastern El Paso will be used to verify that the warning has been received in those areas

(6) The host area authorities for eastern El Paso will disseminate the attack warning.

APPENDIX D - FREMONT COUNTY, COLORADO,

CRISIS RELOCATION WARNING PLAN

APPENDIX D - FREMONT COUNTY, COLORADO, CRISIS RELOCATION WARNING PLAN

(Appendix 9 to Annex A, Directions and Control)

D.1 PURPOSE

The purpose of this Appendix is to define the warning system that will support Fremont County in the event state crisis relocation plans are implemented.

D.2 BACKGROUND

Fremont County has been designated as a host area. In the event that the Governor of Colorado directs the activations of the State Crisis Relocation Plan, Fremont County will have approximately 38,500 people who have been relocated from the Colorado Springs area, billeted in the County. Of these, approximately 8,000 are personnel with critical jobs in the Colorado Springs area. Conditions permitting, these people will commute daily to Colorado Springs and work there on a shift basis.

In addition, during the initial phase of the relocation period, approximately 37,500 Colorado Springs area relocatees will transit Fremont County on State Highway 115 and U.S. Highway 50 enroute to their assigned host counties of Alamosa, Gunnison, and Saguache. While these or any other people are within county limits, Fremont County has the responsibility to provide them a timely CD attack warning, if required.

D.3 BASIC WARNING SYSTEM

In Fremont County the initial warning notification is received at the Fremont County Sheriff's office at Canon City. The warning is received on State Patrol radio systems from the Pueblo State Patrol Office where there is a NAWAS drop. Upon receiving the warning message, the Duty Officer would phone the Canon City Fire Department, the Florence City Fire Department, the Penrose Warning Officer, and the State Penitentiary. These activities have the only four warning sirens in Fremont County. Upon warning notification, the alarms would be activated.

The sirens provide an outdoor coverage pattern that would include 60 percent of the county population. Station KRLN is notified and would broadcast the warning message.

Further, an additional seven towns and communities are notified by telephone fan out.

D.4 CRISIS RELOCATION CONCEPT

The basic concept for warning operations under crisis relocation conditions is to operate in the same manner as under nonrelocation conditions, to the maximum extent possible. The primary difference in crisis and non-crisis conditions is the near doubling in size of the county population. However, in that these people will be living, eating, and operating from existing buildings that are, in general, located in areas covered by the normal warning system, the nonrelocation warning system will play the central and primary role in a relocation situation warning system. Additional warning capability will be added as the crisis relocation situation develops. This would include the addition of dedicated circuit capability from Canon City to the State Primary and Alternate EOCs in the Denver area and to the Colorado Springs EOC. Additionally, dedicated conference circuits to all Fremont County towns and communities can be established. Further conference circuits from local warning points to all major billeting areas and population activity centers can be installed to expedite warning dissemination as well as coordination and direction functions.

D.5 PREPARATORY ACTIONS

The Fremont County CD Director will take all necessary actions to accomplish the following, relative to the development and implementation of a crisis relocation plan.

1. Maintain close coordination with the State Civil Defense Office and comply with relevant directives
2. Ensure that the crisis relocation plan is reviewed and updated a minimum of every 6 months
3. Prepare information and have available plans, procedures, and material for the instruction on the warning procedures that relocatees will encounter while transiting Fremont County or while enroute to, or living in, their Fremont County host area

4. Establish and maintain close liaison with Colorado Springs CD officials to ensure that they have all necessary information and data to advise Colorado Springs personnel, who will transit or be billeted in Fremont County, of the Fremont County warning system and procedures

5. Have current written agreements and coordinated plans for the dissemination of warning messages via station KRLN

6. Have plans prepared and coordinated with the telephone company for the rapid installation of new support circuits. These would include dedicated telephone service to the primary and alternate EOCs, to Colorado Springs, and to in-county conference circuits linking the CD Director's office, and the Sheriff's office with warning points in other towns and communities to be notified in the event of emergency. Also, local conference circuits from warning points to key billeting, feeding, and operational facility locations in the county should be preplanned.

7. Maximum use will be made of other available communications means for warning dissemination including available radio networks and the Radio-Amateur Civil Emergency Service (RACES).

D.6 CRISIS RELOCATION WARNING SYSTEMS

1. Pre-Relocation Scenario

   If an attack is received prior to the start of relocation the established non-crisis relocation plan will be followed

2. Relocation Scenario

   If an attack warning is received after crisis relocation has started, the following warning procedures will be followed:

   a. The Canon City Fire Department, the Florence City Fire Department, the State Penitentiary, and the Penrose Warning Officer will be notified of the warning and requested to sound their warning sirens

b. Station KRLN will be contacted and requested to broadcast the warning message

c. Warning to the following communities will be made by calling on the dedicated conference network, radio, or dial telephone the designated contacts at the following communities (calling check-list to be developed locally):

Rockvale	Swissvale
Coal Creek	Texas Creek
Cotopaxi	Hillside
Howard	

d. Local warning centers will advise crisis relocation population centers by conference telephone networks, radio, or best available means.

APPENDIX E - PENNSYLVANIA

WARNING PLAN SUMMARY

Table E-1. Pennsylvania Warning Plan Summary (1 of 2)

LOCALITY	POPULATION	WARNING RECEIPT MEANS	FAN OUT	% POPULATION WARNED	NUMBER OF OUTDOOR WARNING DEVICES	DATE OF WARNING PLAN
ADAMS COUNTY (COUNTY COMMUNICATIONS & WARNING CENTER)	88,000	STATE CIVIC DEFENSE COUNCIL TTY SYSTEM	26 FIRE DEPARTMENTS WITHIN THE COUNTY VIA FIRE RADIO AND TELEPHONE	35	20	AUGUST 1972
ALLEGHENY COUNTY (COUNTY COMMUNICATIONS CENTER)	1,668,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 16 POLITICAL SUBDIVISIONS AND TELEPHONE TO OTHERS	75	230	JULY 1977
ARMSTRONG COUNTY (COURT HOUSE)	77,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 26 POLITICAL SUBDIVISIONS AND TELEPHONE TO 30 OTHER SUBDIVISIONS	75 ESTIMATED	30	DECEMBER 1977
BEAVER COUNTY	212,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN AT REGION 2 HQ	75 ASSUMED		
BEDFORD COUNTY (BEDFORD MOTOR INN HOTEL)	43,300	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 11 COMMUNITIES, WHFD, WBKE, AND WAKM - PSI	35	21	DECEMBER 1976
BERKS COUNTY (COUNTY COURT HOUSE)	366,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE AND RADIO TO 22 POLITICAL SUBDIVISIONS	97	100	DECEMBER 1976
BLAIR COUNTY	137,400	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE AND RADIO TO 8 FIRE STATIONS AND 1 POLICE STATION	75 ESTIMATED	66	SEPTEMBER 1974
BRADFORD COUNTY	66,200	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN AT REGION 2 HQ	75 ASSUMED		
BUCKS COUNTY (POLICE DISPATCHER IN DOYLESTOWN)	442,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 16 POLICE AGENCIES IN 16 POLITICAL SUBDIVISIONS WHO IN TURN CALL 30 FIRE STATIONS FOR SIREN ACTIVATION AND WBUX & WBCS	65	46	MARCH 1976
BUTLER COUNTY (SUNNYVIEW HOME IN BUTLER)	139,700	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	FIRE RADIO TO 26 POLITICAL SUBDIVISIONS AND TELEPHONE TO 26 OTHER SUBDIVISIONS	63	46	JUNE 1976
CAMBRIA COUNTY	166,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ.	75 ASSUMED		
CAMERON COUNTY (COUNTY JAIL)	7,300	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 2 BOROUGHS AND 6 TOWNSHIPS FOR SIREN ACTIVATION AND WLEM	55	5	JUNE 1976
CARBON COUNTY	61,700	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ.	75 ASSUMED		
CENTRE COUNTY (COUNTY JAIL)	103,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 16 BOROUGHS AND 8 TOWNSHIPS TO SIREN ACTIVATION. TEST OF SYS TEM TOOK 60 MINUTES TO DISSEMINATE WARNING	70	24	OCTOBER 1976
CHESTER COUNTY (POLICE DISPATCHER)	368,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 7 POLICE STATIONS WHO IN TURN CALL 39 OTHER WARN ING POINTS	95	41	UNKNOWN
CLARION COUNTY (COUNTY JAIL)	40,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO WASHINGTON TOWNSHIP FOR SIREN ACTIVATION	10 (ESTIMATED)	1	APRIL 1977
CLEARFIELD COUNTY (DOC)	76,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	FIRE RADIO TO 61 POLITICAL SUBDIVISIONS FOR FIRE SIREN ACTIVATION	42	37	NOVEMBER 1977
CLINTON COUNTY (LOCKHAVEN POLICE STATION)	38,400	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	POLICE RADIO TO 6 BOROUGHS AND 7 TOWNSHIPS AND TELEPHONE TO 2 BOROUGHS AND 14 TOWNSHIPS	60	16	OCTOBER 1974
COLUMBIA COUNTY (COURT HOUSE)	67,400	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	FIRE RADIO TO 16 POLITICAL SUBDIVISIONS AND TELEPHONE TO 11 OTHER SUBDIVISIONS	63	24	FEBRUARY 1968
CRAWFORD COUNTY	86,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ.	75 (ASSUMED)		
CUMBERLAND COUNTY (COURT HOUSE)	168,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 7 CONTROL POINTS WHO IN TURN RELAY WARNING VIA FIRE RADIO TO 12 BOROUGHS AND 20 TOWNSHIPS & WHVL	80	50	FEBRUARY 1972
DAUPHIN COUNTY (COURT HOUSE)	230,700	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	FIRE RADIO TO 15 BOROUGHS AND 16 TOWNSHIPS, TELEPHONE TO 1 BOROUGH, 6 TOWNSHIPS AND WCMB	67	90	JULY 1973
DELAWARE COUNTY (COUNTY COURT HOUSE)	691,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 49 LOCAL WARNING POINTS	70	23	FEBRUARY 1971
ELK COUNTY	35,870	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ.	75 (ASSUMED)		
ERIE COUNTY (COUNTY JAIL)	273,400	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	3 LEVEL TELEPHONE FAN OUT TO 6 FIRE STATIONS AND WLKK	85	40	OCTOBER 1977
FAYETTE COUNTY	157,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ.	75 (ASSUMED)		
FOREST COUNTY (COUNTY JAIL)	5,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 9 POLITICAL SUBDIVISIONS FOR SIREN ACTIVATION	34	3	JUNE 1976
FRANKLIN COUNTY (COUNTY COURT HOUSE)	100,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO FIRE AND POLICE STATIONS IN 6 POLITICAL SUBDIVISIONS	65	32	MARCH 1976
FULTON COUNTY (COUNTY COURT HOUSE)	11,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO AND TELEPHONE TO 1 BOROUGH, 11 TOWNSHIPS, AND 2 VILLAGES (OUTDOOR WARNING DEVICES INCLUDE CHURCH BELLS)	35	3	NOVEMBER 1971
GREENE COUNTY (WAYNESBURG VFC)	30,300	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 14 POLITICAL SUBDIVISIONS AND TELEPHONE TO 12 OTHER POLITICAL SUB DIVISIONS AND WANS	32	10	JULY 1976
HUNTINGDON COUNTY	46,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT REGION 2 HQ.	75 (ASSUMED)		
INDIANA COUNTY	68,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT REGION 2 HQ	75 (ASSUMED)		
JEFFERSON COUNTY	46,100	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 16 POLITICAL SUBDIVISIONS AND TELEPHONE TO 16 OTHER POLITICAL SUB DIVISIONS FOR SIREN ACTIVATION	60	20	JULY 1977
JUNIATA COUNTY	17,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ.	75 (ASSUMED)		

Table E-1. Pennsylvania Warning Plan Summary (2 of 2)

LOCALITY	POPULATION	WARNING RECEIPT MEANS	FAN OUT	% POPULATION WARNED	NUMBER OF OUTDOOR WARNING DEVICES	DATE OF WARNING PLAN
LACKAWANNA COUNTY (SCRANTON CITY POLICE STATION)	237,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	SIREN ACTIVATION IN OLYPHANT BOROUGH ONLY	2	3	UNKNOWN
LANCASTER COUNTY	334,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
LAWRENCE COUNTY (COUNTY JAIL)	100,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 26 POLITICAL SUBDIVISIONS FOR SIREN ACTIVATION AND TELEPHONE TO WKST AND WBZY	80	31	UNKNOWN
LEBANON COUNTY (COUNTY COURT HOUSE)	100,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	28 POLITICAL SUBDIVISIONS THROUGH RADIO CONTROLLED SIREN	30	30	MARCH 1971
LEHIGH COUNTY	269,700	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
LUZERNE COUNTY (COUNTY COURT HOUSE)	340,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 74 POLITICAL SUBDIVISIONS FOR SIREN ACTIVATION, WILK, WAZL	80	108	OCTOBER 1969
LYCOMING COUNTY	116,700	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
MCKEAN COUNTY (COUNTY JAIL)	52,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 14 POLITICAL SUBDIVISIONS, TELEPHONE TO 8 OTHER POLITICAL SUBDIVISIONS AND WESB, WKZA	69	30	JULY 1970
MERCER COUNTY	120,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
MIFFLIN COUNTY	46,100	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
MONROE COUNTY (COUNTY COURT HOUSE)	49,300	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO AND DEDICATED LANDLINE TO 19 BOROUGHS AND TOWNSHIPS, TELEPHONE TO REMAINING 4 BOROUGHS, TOWNSHIPS, AND WVPO	85	38	JULY 1974
MONTGOMERY COUNTY (COUNTY COMMUNICATIONS FACILITY)	630,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 48 POLITICAL SUBDIVISIONS, WIBG, WHAR, WTEL, WPAZ, WIBF, WIFI, WIOZ, WRPV, WDVR	65	151	MARCH 1970
MONTOUR COUNTY	17,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	FIRE RADIO TO 2 BOROUGHS AND 1 TOWNSHIP FOR SIREN ACTIVATION	70	3	JULY 1974
NORTHUMBERLAND COUNTY (COUNTY COURT HOUSE)	100,100	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 10 SIREN CONTROL POINTS AND TELEPHONE TO 36 POLITICAL SUBDIVISIONS	35	39	MARCH 1970
NORTHAMPTON COUNTY	201,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
PERRY COUNTY (COUNTY COURT HOUSE)	32,200	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 12 POLITICAL SUBDIVISIONS FOR SIREN ACTIVATION	46	12	APRIL 1970
PHILADELPHIA COUNTY	1,801,300	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
PIKE COUNTY	12,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
POTTER COUNTY	17,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 31 POLITICAL SUBDIVISIONS FOR SIREN ACTIVATION	44	15	JUNE 1970
SCHUYLKILL COUNTY (COUNTY COURT HOUSE)	161,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 68 POLITICAL SUBDIVISIONS FOR SIREN ACTIVATION	85	UNKNOWN	JUNE 1974
SNYDER COUNTY (COUNTY COURT HOUSE)	31,100	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 14 FIRE STATIONS COVERING 6 BOROUGHS AND 15 TOWNSHIPS	80	15	JULY 1975
SOMERSET COUNTY (COUNTY COURT HOUSE)	78,400	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 27 SIREN CONTROL POINTS	89	60	UNKNOWN
SULLIVAN COUNTY (COURT HOUSE)	6,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 7 COMMUNITIES	68	7	OCTOBER 1970
SUSQUEHANNA COUNTY	38,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
TIOGA COUNTY (COUNTY COURT HOUSE)	41,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 9 BOROUGHS AND 9 TOWNSHIPS, TELEPHONE TO 22 TOWNSHIPS AND 1 BOROUGH, WNBT	40	20	JUNE 1970
UNION COUNTY (COUNTY COURT HOUSE)	20,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE AND RADIO TO 9 SIREN LOCATIONS	60	9	JUNE 1970
VENANGO COUNTY	60,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
WARREN COUNTY (DOC)	40,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	RADIO TO 10 POLITICAL SUBDIVISIONS, WIRE TO 1 POLITICAL SUBDIVISION, AND TELEPHONE TO 8 OTHER SUBDIVISIONS, AND WHAE, WWIN	77	22	JUNE 1970
WASHINGTON COUNTY (COUNTY JAIL)	210,100	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	FIRE RADIO TO 46 POLITICAL SUBDIVISIONS, TELEPHONE TO 21 OTHER POLITICAL SUBDIVISIONS, WARD, WASP, WESA, WJCR, WJPA, AND WEBS	53	103	JUNE 1970
WAYNE COUNTY (COUNTY COURT HOUSE)	32,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TELEPHONE TO 6 BOROUGHS AND 20 TOWNSHIPS. TEST TOOK 30 MINUTES TO DISSEMINATE WARNING	38	35	APRIL 1970
WESTMORELAND COUNTY	370,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
WYOMING COUNTY	21,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	NO WARNING PLAN PRESENT AT THE REGION 2 HQ	75 (ASSUMED)	-	-
YORK COUNTY	332,000	STATE CIVIL DEFENSE COUNCIL TTY SYSTEM	TO POLITICAL SUBDIVISIONS VIA RADIO CONTROLLED SIRENS, TELEPHONE TO WSBA	65	70	SEPTEMBER

July 1979

REVISED MANDATORY STANDARD DISTRIBUTION LIST FOR RESEARCH REPORTS
(ALL PROJECTS)

(Number of Copies - One unless otherwise indicated)

Federal Emergency Management Agency
Research
ATTN: Administrative Officer
Washington, D.C. 20301 (60)

Assistant Secretary of the Army (R&D)
ATTN: Assistant for Research
Washington, D.C. 20301

Chief of Naval Research
Washington, D.C. 20360

Commander, Naval Supply Systems
Command (0421G)
Department of the Navy
Washington, D.C. 20376

Commander
Naval Facilities Engineering Command
Research and Development (Code 0322C)
Department of the Navy
Washington, D.C. 20390

Defense Documentation Center
Cameron Station
Alexandria, Virginia 22314 (12)

Civil Defense Research Project
Oak Ridge National Laboratory
ATTN: Librarian
P. O. Box X
Oak Ridge, Tennessee 37830

Dr. John Billheimer
Systan, Inc.
P.O. Box U
Los Altos, CA 94022

Dr. William W. Chenault
Human Sciences Research, Inc.
Westgate Research Park
7710 Old Springhouse Road
McLean, VA 22101

Dr. Jiri Nehnevajsa
Professor of Sociology
Department of Sociology
University of Pittsburgh
Pittsburgh, PA 15213

Dr. Conrad Chester
Department of Energy
Oakridge Operations
P. O. Box E
Oak Ridge, TN 37830

Ryland Research, Inc.
5266 Hollister Ave.
Suite 324
Santa Barbara, CA 93111

Mr. John Mecozzi
System Development Corporation
2500 Colorado Avenue
Santa Monica, CA 90406

Mr. Don Johnston
Research Triangle Institute
P.O. Box 12194
Research Triangle Park, N.C. 27709

Mrs. Lori O'Neill
Department of Energy
Emergency Electric Power Adm.
2000 M St., N.W. - Room 8212
Washington, D.C. 20461

Mr. Richard K. Laurino
Center for Planning and Research, Inc.
750 Welch Road
Palo Alto, CA 94304

The Dikewood Corporation
1009 Bradbury Drive, S.E.
University Research Park
Albuquerque, N.M. 87106

Ohio State University
Disaster Research Center
127-129 West 10th Avenue
Columbus, OH 43201

Stanford Research Institute
Attn: Mr. Willard Tiffany
333 Ravenswood Avenue
Menlo Park, CA 94025

URS Research Company
155 Bovet Road
San Mateo, CA 94402

Dr. Gerald Klonglan
Department of Sociology and
Anthropology
Iowa State University
Ames, IA 50010

Director
Federal Preparedness Agency, GSA
18th and F Street, N.W.
Washington, D.C. 20405

Administrator, Federal Disaster
Assistance Administration
Room B-133, Department of HUD
451 7th Street, S.W.
Washington, D.C. 20410

Mr. Howard McClennon, President
International Association of Fire Fighters
1750 New York Avenue, N.W.
Washington, D.C. 20006

General Manager
International Association of Fire Chiefs
1329 18th Street, N.W.
Washington, D.C. 30036

Mr. Bjorn Pedersen
International Association of Chiefs of Police
11 Firstfield Road
Gaithersburg, MD 20760

Mr. Ferris Lucas
National Sheriff's Association
Suite 320 - 1250 Connecticut Ave., N.W.
Washington, D.C. 20036

Mr. Gerald W. Collins, Executive Vice President
National Defense Transportation Assoc.
1612 K Street, N.W. - Sutie 706
Washington, D.C. 20006

National Fire Protection Association Library
470 Atlantic Avenue
Boston, MA 02210

National Bureau of Standrads
Disaster Research Coordinator
Attn: Mr. C.G. Culver
Office of Federal Building Technology
Center for Building Technology
Washington, D.C. 20234

Command and Control Technical Center
The Pentagon - BE 685
Washington, D.C. 20301

Mr. Louis V. Spencer
Radiation Theory Section
National Bureau of Standards
Room C-313 -- Building 245
Washington, D.C. 20235

National Academy of Sciences (JH-312)
Commission on Sociotechnical Systems
Committee on Fire Research
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Gov. Leo A. Hoegh
Tinpa Road
Chipita Park, CO 80811

The Council of State Governments
Attn: Mr. Hubert A. Gallagher
Disaster Assistance Project
1225 Connecticut Avenue, N.W. - Suite 300
Washington, D.C. 20036

Dr. Joseph E. Minor
Texas Tech University
Dept. of Civil Engineering
P.O. Box 4089
Lubbock, TX 79409

WARNING SYSTEM RE-EVALUATION AND LOCAL GOVERNMENT GUIDANCE UPDATE — UNCLASSIFIED

Computer Sciences Corporation, Falls Church, VA 22046
DCPA01-78-C-0229 Work Unit 2234D August, 1979 184 p.

This final report presents results of study to assess capabilities of present and potential backbone warning systems and also state and local warning systems. The evaluation gave emphasis to impact of Crisis Relocation Plans (CRP) on the warning systems capabilities. Warning requirements and policy were also reviewed and changes recommended, as required. Evaluation of backbone systems includes the National Warning System (NAWAS), National Weather Service (NWS), Decision Information Distribution Systems (DIDS) and others. Detailed analysis was made of Colorado state and local warning systems. Report includes CRP warning appendices for Colorado, Colorado Springs risk area, and Fremont County host area.

WARNING SYSTEM RE-EVALUATION AND LOCAL GOVERNMENT GUIDANCE UPDATE — UNCLASSIFIED

Computer Sciences Corporation, Falls Church, VA 22046
DCPA01-78-C-0229 Work Unit 2234D August, 1979 184 p.

This final report presents results of study to assess capabilities of present and potential backbone warning systems and also state and local warning systems. The evaluation gave emphasis to impact of Crisis Relocation Plans (CRP) on the warning systems capabilities. Warning requirements and policy were also reviewed and changes recommended, as required. Evaluation of backbone systems includes the National Warning System (NAWAS), National Weather Service (NWS), Decision Information Distribution Systems (DIDS) and others. Detailed analysis was made of Colorado state and local warning systems. Report includes CRP warning appendices for Colorado, Colorado Springs risk area, and Fremont County host area.

WARNING SYSTEM RE-EVALUATION AND LOCAL GOVERNMENT GUIDANCE UPDATE — UNCLASSIFIED

Computer Sciences Corporation, Falls Church, VA 22046
DCPA01-78-C-0229 Work Unit 2234D August, 1979 184 p.

This final report presents results of study to assess capabilities of present and potential backbone warning systems and also state and local warning systems. The evaluation gave emphasis to impact of Crisis Relocation Plans (CRP) on the warning systems capabilities. Warning requirements and policy were also reviewed and changes recommended, as required. Evaluation of backbone systems includes the National Warning System (NAWAS), National Weather Service (NWS) Decision Information Distribution Systems (DIDS) and others. Detailed analysis was made of Colorado state and local warning systems. Report includes CRP warning appendices for Colorado, Colorado Springs risk area, and Fremont County host area.

WARNING SYSTEM RE-EVALUATION AND LOCAL GOVERNMENT GUIDANCE UPDATE — UNCLASSIFIED

Computer Sciences Corporation, Falls Church, VA 22046
DCPA01-78-C-0229 Work Unit 2234D August, 1979 184 p.

This final report presents results of study to assess capabilities of present and potential backbone warning systems and also state and local warning systems. The evaluation gave emphasis to impact of Crisis Relocation Plans (CRP) on the warning systems capabilities. Warning requirements and policy were also reviewed and changes recommended, as required. Evaluation of backbone systems includes the National Warning System (NAWAS), National Weather Service (NWS) Decision Information Distribution Systems (DIDS) and others. Detailed analysis was made of Colorado state and local warning systems. Report includes CRP warning appendices for Colorado, Colorado Springs risk area, and Fremont County host area.